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References should be listed at the end of the paper in alphabetical order. Articles in preparation or articles submitted for publication, unpublished observations, personal communications, etc. should not be included in the reference list but should only be mentioned in the article text (e.g., A. Kingori, University of Nairobi, Kenya, personal communication). Journal names are abbreviated according to Chemical Abstracts. Authors are fully responsible for the accuracy of the references.

Examples:


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Review

A real options approach to ship investment appraisal

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Accepted 5 March, 2012

Initially, this paper presents a methodology for analysis of investment in a tanker ship, based on Monte Carlo simulation of auto-correlated series of time-charter rates and prices of new building and second hand ships. Subsequently, a real options analysis is introduced, considering the possibility of project abandonment. The method is employed for evaluation of the investment in a suzemax tanker. The results indicate that the investment analysis outcome is significantly sensitive to the consideration of the managerial flexibility to project abandonment. Finally, the paper discusses the effect of the decision maker's risk attitude on the abandonment option value.

Key words: Shipping investment appraisal, real options, risk attitude.

INTRODUCTION

The shipping sector is peculiar in terms of the investment rationale and investor behavior. The cyclical nature of the market, its extreme volatility and the international character of the operations are the main factors that confer unique characteristics to the sector. The rationale behind the investment decision varies according to the different shipping sectors, as well as the types of players. For example, decision criteria and available information vary between a container operator and a bulk carrier shipowner. An oil company willing to implement a logistical strategy and an asset player would also have different approaches to investment decision making. The nature of the ship investment problem has been studied by many authors, such as Klausner (1970), Haralambides (1993) and Thanopoulu (2002).

Real options analysis (ROA) is nowadays largely applied for evaluating investment decisions under uncertainty. Particularly, in the shipping sector, ROA has been increasingly applied. Gonçalves (1993) has pioneered the application of real options approach in shipping economics. More recently, ROA has been recognized as a suitable methodology for shipping investment analysis.

Bendall (2002) presents an overview on ROA applicability and a discussion on the relevant managerial options in response to future events in the uncertain environment of shipping markets. Some other authors have also dealt with ROA in ship investment decision making (Bendall and Stent, 2005; Dikos (2008).

The present paper presents a methodology for ship investment analysis, considering the abandonment option. A typical tanker ship investment decision problem is analyzed on the basis of Monte Carlo simulation of the future behavior of time-charter and second hand prices. The contribution of this work is two-fold: it proposes a simple and practical approach and discusses the effect of the tanker investor's risk aversion on the abandonment option value. This significant effect was not considered before in the literature.

Initially, an alternative Monte Carlo approach to investment analysis in oil tankers is presented. Next, the method is adapted to incorporate the option to abandon. Finally, the article raises and discusses the issue of the impact of decision maker’s risk aversion on the option value.

ANALYSIS OF INVESTMENT IN OIL TANKERS

The present study considers the case of an oil company that runs both owned and chartered ships. The parcel of the demand for maritime transport that the oil companies engaged in the international market fulfill with owned
Table 1. Daily operational costs.

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
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<tr>
<td>H&amp;M insurance</td>
<td>3.49</td>
</tr>
<tr>
<td>P&amp;I insurance</td>
<td>0.72</td>
</tr>
<tr>
<td>Maintenance &amp; Repair</td>
<td>2.49</td>
</tr>
<tr>
<td>Store/Supplies/Spares</td>
<td>1.48</td>
</tr>
<tr>
<td>Administration</td>
<td>0.94</td>
</tr>
<tr>
<td>Total Operational Costs</td>
<td>9.12</td>
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</table>

In order to estimate a model for the average annual running costs, nevertheless, ship prices and time charter rates, new building and second-hand ship prices. In order to estimate a model for the average annual rates of 1-year time charter contracts, data obtained from Clarkson (2011) during the period between 01/1981 and 12/2010 will be used. Since the period is long, it will be necessary to correct the values and take the inflation rate of the American dollar into consideration. The consumer price index will be used (U.S. Department of Labor, 2011). The same procedure was used to new building and second hand series. Figure 1 shows the 1-year time charter series observed in US$ and corrected to US$ (December, 2010).

This analysis will require the estimation of the residual value of 15-year-old ships, which will be calculated based on the value of a 5-year-old ship, through an exponential decay function.

In order to model the series of time charter rates, and new building and second hand prices, three models were compared: mean reversion, exponential smoothing and ARIMA. Table 2 shows the respective square errors. The errors have been estimated for a validation set formed by the last 24 observations (the first 336 have been used for estimation).

The mean reversion model, which best fitted to data, has been adopted. Its mathematical expression is the following:

\[ X_t = X_{t-1}e^{-\eta \Delta t} + \bar{X} (1 - e^{-\eta \Delta t}) + \frac{1 - e^{-2\eta \Delta t}}{2\eta} \sqrt{\frac{\sigma^2}{N(0,1)}} \]

Where: \( \eta \) – speed of reversion, \( \bar{X} \) - average of the period, \( \Delta t \) – time interval (in this case 1).

In order to determine the value of \( \eta \), a nonlinear programming model for square error minimization was employed. This way, the average speed of reversion was determined for each series:

- Time charter (TC) \( \eta_{TC} = 0.11781 \times 10^5 \)
- New building (NB) \( \eta_{NB} = 128.981 \times 10^5 \)
- Second hand (SH) \( \eta_{SH} = 12.4726 \times 10^5 \)

The simulation of the series will be based on the generation of pseudo-random series for the white noise processes in the expressions:
Table 2. Alternative models of time series – square error.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time Charter</th>
<th>New Building</th>
<th>Second Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean reversion</td>
<td>131.48</td>
<td>201.74</td>
<td>346.19</td>
</tr>
<tr>
<td>Exponential smoothing</td>
<td>804.07</td>
<td>901.78</td>
<td>1,098.52</td>
</tr>
<tr>
<td>ARIMA</td>
<td>381.59 (1, 2, 1)</td>
<td>452.28 (2, 2, 1)</td>
<td>504.64 (1, 0, 1)</td>
</tr>
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</table>

Table 3. Observed correlation coefficients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time Charter</th>
<th>New Building</th>
<th>Second Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Charter</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Building</td>
<td>0.09769</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Second Hand</td>
<td>0.76729</td>
<td>0.83289</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 2. Simulation of the time charter annual costs minus the running costs - million US$.

\[
TC_t = TC_{t-1} \cdot e^{-\eta_{TC}} + \bar{TC} \cdot (1 - e^{-\eta_{TC}}) + \varepsilon_t
\]

\[
NB_t = NB_{t-1} \cdot e^{-\eta_{NB}} + \bar{NB} \cdot (1 - e^{-\eta_{NB}}) + \omega_t
\]

\[
SH_t = SH_{t-1} \cdot e^{-\eta_{SH}} + \bar{SH} \cdot (1 - e^{-\eta_{SH}}) + \upsilon_t
\]

Where: \(TC_t\) = time-charter rate in year \(t\), \(NB_t\) = price of the new building in year \(t\), \(SH_t\) = price of the 5-year-old-tank in year \(t\), \(TC, NB, SH\) = mean values of the series, \(\varepsilon_t, \omega_t, \upsilon_t\) = white noise (N(0,1)), \(\eta_{TC}, \eta_{NB}, \eta_{SH}\) = reversion speeds.

The TC, NB e SH series presented the correlation coefficients indicated in Table 3, in the sample of 360 observations, between 01/1981 and 12/2010.

To simulate the series for the 15-years useful life period, it will be necessary to ensure that the correlation pattern is compatible with the observed. For that, the Cholesky Decomposition Method has been used (Scheuer, 1962). Figure 2 shows a subset of the time-charter annual cost series minus the running costs, in order to illustrate the behavior of the sample.

In the conventional discounted cash flow approach, a risk-adjusted discount rate should be taken to net present value (NPV) calculation. The risk-adjusted rate is the sum of the risk-free interest rate, used to discount for the time value of money (pure discount) and a discount risk premium, used to compensate for the risk associated with the project (Trigeorgis, 1996; Dragotă and Dragotă, 2009). This rate, which can be determined by the capital asset pricing model (CAPM), depends on parameters that may be difficult to determine. However, when the probability distribution of NPV is derived from Monte Carlo simulation of future cashflow, the risk-free rate should be used, as discussed for example, in the seminal work of Trigeorgis (1996). In the following analysis, the discount rate \(i = 6\%\) would be applied. This figure corresponds to a risk-free interest rate estimated for the Brazilian economic environment. Nevertheless, in order to assess the sensitivity of the result to the discount rate, the following analysis will be performed considering three different rates: 4, 6 and 8%.

For each element of the sample, formed by the set of simulated series, the NPV is calculated through:

\[
NPV = \sum_{k=0}^{15} (TC_K - C_{op}) \times \frac{1}{(1+i)^k} + \frac{RV}{(1+i)^{15}} - NB_0
\]

Where: \(TC_K = \) Time charter annual costs, \(C_{op} = \) Annual fixed costs, \(i = \) Discount rate, \(RV = \) Residual, \(NB_0 = \) New building price value.

Table 4 presents the descriptive statistics of the NPV samples resulting from the Monte Carlo simulation, for the three levels of discount rate. The main results, for supporting investment decision are the expected value of NPV and the risk, which can be measured by the probability of NPV resulting negative (\(P[\text{NPV}<0]\)).

Figure 3 shows the normal distribution fitted to the sample data. The results show the extremely significant impact of the risk-free discount rate on the investment decision.
In the previous analysis, like it is normally done in conventional discounted cash flow (DCF) method, it was supposed that, once the investment is made, the tanker will operate in the same conditions during the whole useful life. Actually, this hypothesis does not represent the reality. The analysis can be improved by the introduction of the abandonment option. That is, by considering a new model, in which the project could be reevaluated in certain intervals, and, in case of poor performance, abandoned by selling the ship for the market price.

**ANALYSIS OF INVESTMENT IN OIL TANKERS WITH ABANDONMENT OPTION**

In the financial market, an option is the right, but not the obligation, of the holder to perform a certain action, at a pre-agreed price, on a given date. The agent who “launches” the option has the obligation to buy or sell the object of the option (bonds, commodities, stocks or similar products), under the conditions established, if it is the buyer’s wish (Dixit and Pindyck, 1994).

The launcher receives a premium as soon as the option is sold, since he/she has taken the risk of assuring the exercise of the action under pre-established conditions. When the holder buys an asset we call it call option, and when he/she sells it we call it put option. The pre-established price is called exercise price or strike price. An option that may be only exercised at its expiration date (maturity date) is called European option, while an option that may be exercised at any time before the expiration date (at the life of the option) is called American option.

A call-option is in-the-money for the holder if the current market value of the underlying asset is above the exercise price of the option, while a put option is in-the-money if the current market value of the underlying stock is below the exercise price. Otherwise, the option will not be exercised.

During the useful life of the project, the real options analysis incorporates the flexibility associated to strategic decisions to the evaluation of investments made through the discounted cash flow method, from an analogy with financial options.

The origin of the term "real options" can be attributed to Myers (1977), who first identified the fact that many corporate real assets can be viewed as call options. It was the beginning of a new approach to the investment analysis, based on the analogy between an option and the managerial flexibility for strategic decision making in an investment project.

A company with an irreversible investment opportunity has the option to defer the investment (option to delay). It has the right, but not the obligation, to buy a product (the project) in the future for the exercise price (initial investment). When the company invests, it exercises the option and pays an opportunity cost equal to the value invested.

The exercise of the option (investment) is irreversible, but the company has always the possibility to delay the investment, until the market conditions become more advantageous, and more information about the project and the factors that influence it could be obtained, in order to reduce the uncertainties.

A capital investment project can be seen as a set of real options. Among which we can mention the options to defer, abandon, or interrupt the project; cancel new stages of the investment; and alter the production scale (expand, contract, shut down temporarily, restart), the uses (entry and exit) and the growth options (Trigeorgis, 1996).

The real options analysis is complementary to the net present value, including the flexibility value, or the options value, in the calculation of the NPV:

\[
\text{TOTAL FINAL NPV} = \text{PROJECT'S NPV} + \text{OPTION'S VALUE}
\]

Thus, a project with negative net present value may be viable, if the managerial flexibility is considered, such as the possibility to defer, expand or abandon the project after the implementation.
The real option analysis has already been proposed by many authors as a solution for decision problems in shipping. Two works in particular should be mentioned.

Gonçalves (1993) proposed a real options approach for investment decisions and ship chartering strategy planning. The hypotheses of the work are too restrictive, but the mathematical model proposed brings an interesting and pioneering approach. Bendall (2002) presents a discussion on the applicability of the real options in ship investment analysis.

In the previous section, the investment in a crude oil tanker was analyzed under the hypothesis, implicit in the conventional DCF method, that, once the investment is made, the tanker will operate during the whole useful life period.

This analysis can be clearly improved, as a way to bring the model closer to reality. It is important to consider that in case of unfavorable market conditions or negative expectations, the investor has the option to abandon the project by selling the tanker, as a way to reduce or avoid greater losses.

In the sequence, the model will be modified to consider the value of this option. The new model will be based on the hypothesis that the investor will reevaluate the project every five years (that is, in the 5th and 10th years), deciding between continuing with the project and selling the tanker. This model is able to identify the principal effect of the managerial flexibility and the value of the information acquired throughout the project.

To simulate the decision to abandon or continue with the project in year 5, a sample of NB, TC and SH series is generated for the period between the 5th and 15th years with the information available in year 5 for each observation of the sample that was initially generated for the series between the years 0 and 15. The expected value E(NPV5) is calculated for each simulation scenario for the period between years 0 and 15, from samples resulting from cash flow simulation for the period between years 5 and 15. To simulate the abandonment or continuation decision-making process, it is necessary to know the minimum value accepted by the decision maker, which will be called NPVbase.

If E(NPV5)<NPVbase, the project is abandoned in year 5, and NPV is calculated from the cash flow between the years 0 and 5. If E(NPV5)≥NPVbase, the project continues, at least until year 10. In this case, simulation of the abandonment decision-making process will be repeated in year 10. Figure 4 illustrates the structure of the samples.

Thus, for projects abandoned in year 5, NPV corresponds to the period from years 0 to 5; for projects abandoned in year 10, NPV corresponds to the period from years 0 to 10; and for projects continued beyond year 10, NPV corresponds to the period from years 0 to 15. The value of the abandonment option in years 5 and 10 is equal to the difference between the expected value of NPV in the sample resulting from this simulation and the result obtained, without consideration of the abandonment option.

RISK ATTITUDE AND REAL OPTION VALUE

As discussed previously, the simulated cash flows are discounted at a risk-free rate. Thus, a minimum acceptable NPV equal to zero (NPVbase=0) corresponds to a risk neutral decision maker. For a risk adverse investor, NPVbase will be positive. The greater the risk aversion, the higher the NPVbase. A critical issue in the above analysis is that it is necessary to get an estimation of NPVbase, in order to simulate the abandonment decision making process. The decision maker, facing the uncertain prospects for the remaining period, will decide, in years 5 and 10, to continue or to abandon the project, according to his or her own risk attitude. Naturally, the investor’s risk attitude is influenced by the NPV volatility and the amount of the investment. Table 5 and Figures 5, 6 and 7 shows the option value as a function of NPVbase.
Table 5. IRR distribution resulting from the simulation.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Fit</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.062</td>
<td>0.062</td>
</tr>
<tr>
<td>Median</td>
<td>0.062</td>
<td>0.066</td>
</tr>
<tr>
<td>Std. Deviation</td>
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<td>0.035</td>
</tr>
<tr>
<td>Variance</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Skewness</td>
<td>0</td>
<td>-0.501</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3</td>
<td>3.443</td>
</tr>
</tbody>
</table>

The results indicate how significant is the effect of the investor’s risk attitude in the option value. Also, the impact of the risk-free discount rate on the option value is evidenced.

CONCLUSION

The real options analysis has been used as an alternative to the traditional discounted cash flow approach, which does not consider important elements related to the managerial flexibility present in many investment projects. The present work has proposed a Monte Carlo approach, taking the option to abandon into consideration. The case of a tanker with a useful life of 15 years was analyzed, with an option to abandon in years 5 and 10.

The consideration of the abandonment option can significantly affect the indicators that support investment decision making. In fact, projects that would be rejected by the conventional approach can become viable, if the managerial flexibility is taken into consideration. Particularly, in the case of investment in oil tankers, the conventional discounted cash flow analysis is demonstrated not to be able to provide useful elements for practical decision making.

Finally, the analysis evidenced the effect of the decision maker’s risk attitude on the value of option to abandon.

REFERENCES


**Review**

**Ethical business practices: The consumer protection act and socio-economic transformation in South Africa**

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Ethical reputation and customer satisfaction and loyalty are critical factors for South African business. It is the social responsibility of business owners or suppliers to ensure that they carry out good trade practices. Consumers from disadvantaged communities were previously excluded from participation in fair business transactions in many sectors. Access to goods and services was problematic. Apart from certain common law rights for consumers generally, consumer protection was unclear and not codified. In addition, low literacy levels are serious disadvantage for consumers who become easy targets for unfair business practices because of their lack of understanding of their rights or the means to acquire legal assistance. The Consumer Protection Act (CPA) 68 of 2008 addresses these problems. The CPA, which came into effect in South Africa as from 1 April 2011, sets the basis for consumer protection in this country and is the first of its kind. It promotes a fair and accessible marketplace for consumer products and services. It also sets out ethical norms and national standards relating to consumer protection. This article explores specific provisions of the Act, with a focus on the role of business in transformation, as far as consumer protection is concerned, including the significance of plain and understandable language in contracts. It uses a descriptive approach to reveal the social responsibility of business in a transforming society as far as consumer rights are concerned. It concludes that the impact of the Consumer Protection Act for business is far-reaching; that business has a significant role to play with regard to consumer protection and transformation of a historically disadvantaged society, and that the law does play a role in placing pressure on businesses to act in a socially responsible manner.

**Key words:** Consumer protection, transformation, business practices, contracts, consumer rights.

**INTRODUCTION**

Ethical and socially responsible actions are important contributors for long term growth and profitability of business. The external focus of ethical practices relates to the relationship that business establishes with consumers. Engelbrecht and Rousseau (2007: 354) define “consumerism” as a set of activities on the part of independent organizations, government, and business organizations, designed to protect the consumer.

In terms of the recent Companies Act (South Africa, 2008b), companies have to protect the interests, not only of shareholders, but also those of consumers and the community. Business has a broader social role to play. They have to report on their activities with regard to social and economic development, as well as the promotion of equality and development of the communities in which they operate.

In South Africa, consumers from disadvantaged communities were previously excluded from fair business transactions. Also, the low literacy levels of consumers, especially from these communities, resulted in them being seriously disadvantaged when it came to
understanding the content and effect of business contracts. In addition, the terms included in “standard form” contracts, generally favoured business or were unfair or unreasonable to the consumer. The Consumer Protection Act (CPA) (Republic of South Africa, 2008a) therefore aims to promote a fair and accessible marketplace for consumer products and services; prohibit unfair marketing and business practices; promote full participation of the disadvantaged communities as consumers and protect consumers from unfair, unreasonable and unjust business practices.

Many countries have adopted legislation to control unfairness in business contracts (such as the Unfair Contract terms Act 1977 in the UK). In South Africa, parties had the freedom to determine the content of contracts and the courts were reluctant to declare a contract void for the reason that it was unfair, until the decision in 1989 in the case, Sasfin (Pty) Ltd v Beukes (1989: 1) which set aside an unfair contract (Sharrock, 2010: 297-298).

Until recently, consumer protection was unclear and not codified in South Africa. There were certain common law rights for consumers generally and legislation did provide limited protection to the customer in terms of legislation. The CPA of 2008 was signed into law on 24 April 2009. Certain sections were applicable twelve months later (April, 2010) and the general effective date when all provisions were to be implemented, was 18 months later (September 2010).

However, the general effective date was postponed to April 2011 to give businesses more time to prepare for the implementation of the Act. The CPA replaces the Consumer Affairs (unfair business practices) Act of 1988, which provided for the prohibition and control of unfair business practices.

This article uses a descriptive approach to reveal the social responsibility of business in a transforming society as far as consumer rights are concerned. It first examines the significance of ethical business practices and unfolds the role of business in transformation in South Africa. Secondly, it examines specific fundamental rights of the consumer set out in the CPA. Thirdly, it focuses on the right to information in plain and understandable language.

**ETHICAL BUSINESS PRACTICES**

Do customers care about ethics? Can doing good help businesses do better? Results from a recent study suggest that ethical behaviour helps the bottom line of a company (Doane, 2005). Increased sensitivity to ethical reputation is a major advantage in South Africa and businesses are realizing that good ethics and social responsibility are good business practices which will contribute to profitability and growth. Ethical reputation and customer satisfaction and loyalty are critical predictors for South African business and provide an edge over the competition.

**What are business ethics?**

Ethical business practice means “doing the right thing” as far as consumer demands are concerned. Increased sensitivity to ethical reputation is a major advantage, and it determines the conduct of businesses when dealing with customers, from individuals to corporate clients.

According to Svensson and Wood (2004), business ethics has an external emphasis considering the gap between organizations’ ethical actions and behaviour in ongoing business practices, and the marketplace’s or society’s perceptions of the organization’s ethical actions and behaviour in their business practices. They maintain that “corporate ethics”, on the other hand, has an internal emphasis considering the gap between the management’s ethical actions and behaviour and the staff’s perception of the management’s ethical actions and behaviour in on-going business practices.

Unethical business practices, as far as consumers are concerned, include: discrimination against customers on the grounds of race; standard form contracts that are one-sided and over-protective of business; misleading or deceptive advertising (for instance, requiring the consumer to pay a higher price than the displayed price, or enticing young consumers who do not fully understand the consequences of acting on misleading advertising); contracts that contain onerous clauses in fine print and unintelligible language, and disclaimers which unfairly exclude or limit the liability of business.

**Why should business engage in ethical business practices? What’s in it for business?**

Society and marketplace stakeholders no longer judge an organization’s performance on profit alone. Consideration of the ethical and socially responsible actions underlying profitability, should lead organizations to aspire to being better corporate citizens in order to achieve ethically long term profit. As the social conscience of many in the developed world became more acute in the latter years of the twentieth century, there was a corresponding rise in the expectations of organizations to be better corporate citizens and to invest in making the society a better place (Campbell et al., 2002; Rondinelli, 2003).

Do the ethical structures and processes in place assist the bottom line of an organization? Today it would appear that the stakeholders of first world economies look more deeply at such profit declarations. The declaration of a profit or a loss is only the first of a set of criteria upon which the marketplace and society evaluates the performance of the organization. This is where ethical business practices become crucial and may benefit the organization in both the short and the long term.
There are expectations and perceptions that vary between organizations, the marketplace and societies that surround organizations, and that influence the predominant belief or conviction of what may, or may not, be seen as ethical business practices. One of the contributing factors is that of government legislation, which may frame and define the criteria of ethical business practices across organizations. Developed western style democracies have laws that govern the expected and perceived actions and behaviours in business practices as they tend not to be self-regulatory (Carson, 2003; Davies, 2001; Piety, 2004; Rondinelli, 2003).

Historically, they have been able to impact societies’ and their citizenry’s expectations and perceptions of organizations’ business practices (Grit, 2004; Whawell, 1998). Organizations are also confronted with societal expectations and perceptions beyond purely economic issues, such as environmental and social change responsibilities (Handelman, 2000; Handelman and Arnold, 1999).

With the awakening of globalization, there is a realization in first world economies that there are organizations that appear to have diverse sets of actions and behavioural standards depending upon the country in which they find themselves at the time (McMurtry, 2002; Sorensen, 2002). There is a need for ethical structures that surround the modes in which organizations strive to inculcate corporate and business ethics. Without them there are no supports in place to create ethical processes and evaluate ethical performance. This area serves as a support that the organization and its staff should be able to relate to at the strategic, tactical and operational levels of business practices. It is a point of reference to other stakeholders in the marketplace and society. It is a point of reference to other stakeholders in the marketplace and society. It is important and should be considered when developing, managing and monitoring ethical business practices.

The sentiments and views of other stakeholders are important to any organization as they may be affected by the success and/or failure of the organization (Heath and Norman, 2004). Good organizations do not differentiate between institutional stakeholders and other stakeholders in the marketplace and society. The welfare of all stakeholders should be treated equally regardless of the monetary value that they represent to the organization. Ultimately, all stakeholders of the organization are important and should be considered when developing, managing and monitoring ethical business practices.

The South African customer today is therefore interested in whether the organization made a profit or a loss and how its business practices in the marketplace have impacted upon its shareholders. The Companies Act 71 of 2008 (Republic of South Africa, 2008b) has put pressure on business practices and therefore requires a different focus, in respect of the ethical aspects of the organization’s business practices. Triple bottom line, corporate governance, corporate social responsibility, and broad-based black economic empowerment (BBBEE) indicate a major change from the belief in previous eras that organizations are only in existence to make profits.

So what obligations does legislation impose on business? Legislation compels companies to act in a socially responsible manner. This dictates that corporate social responsibility should be aimed at social conduct where stakeholders’ interests are taken into account either through indirect legislation or voluntary conduct.

The effect of the BBBEE Act is that companies and directors are forced to take into account the interests of the previously disadvantaged South Africans. The Act promotes economic transformation to enable meaningful participation of black people in the economy and to achieve a substantial change in the racial composition of ownership and management structures of existing and new enterprises (Venter et al., 2009: 236). The BBBEE Act is but one example of the use of legislation to guide performance appraisal and staff education is one such area and contributes to strengthening corporate efforts in managing and monitoring ethical business practices across the organization (Fraedrich, 1992).
the corporate conscience. The Act confronts companies with the political and socio-economic reality in the country within which they operate and involves them in the process of reform and reconciliation. It is crucial that corporate conscience and Government efforts for reforms are combined and coordinated to ensure that it functions to the benefit of the country at large (Esser and Dekker, 2008).

A positive ethical climate promotes job attitudes and customer oriented behaviours and increases customer satisfaction. A company providing ethical reputation accentuates customers’ feelings of self-esteem (Schneider and Bowen, 1999). Customers will then see ethical reputation as a surrogate for reliability and quality of service when selecting providers. From a marketing perspective, suppliers consider ethical behaviour as a way of differentiating themselves as well as a means to gain competitive advantage. Recognizing this, Nike, GAP and Dell, to name a few firms, are setting ethical guidelines to increase their corporate and brand image. To buttress their ethical image, firms support popular social causes such as education, job creation, health, hunger eradication and protection of the environment. They are also placing greater emphasis on implementation of ethical codes in their domestic and international operations. This is consistent with the belief that measures of company success must go beyond revenue and profit and should also include intangible aspects like empathy, the ability to understand and relate to the needs of stakeholders and society at large (Natale and Sora, 2009).

THE ROLE OF BUSINESS IN TRANSFORMATION

South African company law dictates that, directors have a fiduciary duty towards all shareholders and a wider range of interests should be protected, such as employees, consumers, suppliers, the community, and the environment (Esser and Dekker, 2008: 159 to 160). The recent Companies Act (Republic of South Africa, 2008b) (Section 7) recognises the broader social role of companies and re-affirms the company structure as a means of achieving economic and social benefits in a manner that enhances the economic welfare of South Africa.

In terms of the Act (Section 72), companies have to elect a social and ethics committee to monitor and report on their activities with regard to social and economic development, promotion of equality and development of the communities in which they operate (Deloitte, 2010). In terms of the core principles of the King III Report, social injustice has to be eradicated.

Further, social transformation and redress is important and needs to be integrated within the broader transition to sustainability (Pwc, 2011). The King III Report, therefore, directs companies to “proactively manage the relationship with its stakeholders” and strive to achieve the correct balance between its various stakeholder groupings, in order to advance the interests of the company (Olson, 2010: 222 to 223).

Corporate social responsibility (CSR) has evolved into three areas of the triple bottom line, namely, economic, social and environmental. While the economic dimension is about profitability, the social dimension means that companies have to go beyond fulfilling their legal responsibilities and invest in human capital, as well as take actions to contribute to the welfare and interests of the staff and community. In South Africa, the social aspect of CSR contributes toward the upliftment of society (Terry, 2010: 18).

The equality clause in the South African Constitution (Republic of South Africa, 1996, Section 9) provides for the equal protection and benefit of all persons and allows for legislative or other measures that are designed to advance or protect persons disadvantaged by unfair discrimination. The CPA therefore lays the foundation in this respect for the consumer. The CPA is the first piece of legislation to set out the rights of consumers and the responsibilities of suppliers. This Act will develop a means to protect the interests of all consumers, more specifically the disadvantaged consumer. Business therefore has a socially responsible role to play as far as consumer protection and transformation of historically disadvantaged societies in South Africa are concerned. Armed with information, customers are becoming more sophisticated and demanding, and this makes business realise the need for trust and commitment as a means to developing customer loyalty.

ETHICAL BUSINESS PRACTICES, TRANSFORMATION AND CONSUMER PROTECTION IN SOUTH AFRICA

Consumers from disadvantaged communities were previously excluded from participation in fair business transactions in many sectors. Access to goods and services was problematic. Apart from certain common law rights for consumers generally, consumer protection was unclear and not codified. In addition, a significant proportion of consumers in the country, have low literacy levels, and as a result are seriously disadvantaged when it comes to understanding the content and effect of business contracts. It also seriously hampers their ability to negotiate on an equal footing with business, especially since most businesses use standard form contracts. In addition, disadvantaged consumers, because of their lack of understanding of their rights or the means to acquire legal assistance, result in them being easy targets for unfair business practices.

The problem of discrimination and inequality

The preamble to the CPA recognizes the far reaching
and devastating effects that apartheid has had in burdening the nation with “unacceptably high levels of poverty, illiteracy and other forms of social and economic inequality”. In view of the ravages of discrimination, particularly on the basis of race and gender, equality and the prevention of discrimination have played a significant role in post-apartheid South Africa. Clearly, apartheid resulted in discrimination in almost every aspect of social, political and economic life. Black people were prevented from becoming owners of property or even residing in areas classified as “White”, senior jobs and access to universities were denied to them, civic amenities, including transport, and many shops were closed to them and instead, separate and inferior facilities were provided (Brink and Kitshoff, 1996: 768). Hence, with the adoption of the 1996 Constitution, there has been much discussion and debate about correcting these discriminatory practices.

Since many of these inequalities were a result of unjust legislation from the past, it is not surprising that the attainment of the ideals of equality and a fair and just society has been directed towards the state. Clearly, the state had to carry much of the responsibility in removing the unjust legislation and introducing measures to prevent inequalities in the future and to redress injustices of the past.

However, the attainment of the ideals of a society free of discrimination and injustice is not attainable without the application of such ideals to the private sector, that is, individuals and business. The apartheid system also supported, encouraged and even demanded discrimination and unfair treatment of customers by business entities. Madlalda has observed in the judgement in Du Plessis v De Klerk (1996: 732) that the extent of the oppressive measures in South Africa was not confined to government/individual relations, but applied equally to individual/individual relations.

In the past, there have been glaring differences in the service quality and access to goods and services that were offered to different groups of customers, in retail business as well as in service provision. For instance, a chain store offering goods of an inferior quality at an outlet supported largely by Black customers at the same price as that paid by other customers; where banks “redline” certain residential areas, making it difficult for borrowers especially from historically disadvantaged groups to access housing loans; or where accommodation or admission to an entertainment club is refused on the basis of race (Reddy, 2006: 785 to 786).

Problems associated with contracts

For the average consumer, contracts are an essential part of life, something that cannot be avoided if one wants to participate in the commercial world. The principle of pacta sunt servanda followed in South Africa with respect to contracts, implies the freedom to contract. Parties are free to contract with whomever they wish to and they are also free to negotiate the terms applicable to such contract. If the parties to a contract adhere to this principle it would mean that there would be a fair degree of certainty regarding the contract and the parties would be aware of their rights and duties. They are also aware that such rights are enforceable (Newman, 2010: 735). Newman (2010: 735 to 736), however, reminds that this is hardly the situation in the real world as a large proportion of the population have very little experience at contracts and even those that do have such experience have no control over the terms that are included in the contract since businesses often use “standard form contracts”. He defines a standard form contract as a contract where the terms and conditions applicable are contained in a standardized document, which has been drawn up in advance by one of the parties and the contract is available for acceptance in that form only. Since customers lack the bargaining power when standard form contracts are used, some customers fail to read the provisions as they feel they will be bound by the terms anyway.

Further, the standard-form contracts include terms that are not negotiated and are generally one sided and over-protective of business, so as to minimize its risk and exempt it from as much liability as possible. According to Sharrock (2010: 296), businesses generally adopt a “take-it-or-leave-it” stance if a customer requests a change in the standard terms. These standard form contracts also include terms that are unfair to the consumer. Although the consumer has the option not to agree to the terms and conditions, or to look elsewhere for better terms, customers generally agree with the pre-formulated terms without questioning them or requesting that they be amended (Sharrock 2010, 295 to 296).

In addition, customers become easy targets for unfair business practices due to their inability to understand the contents of such contracts or obtain legal assistance. An added challenge for consumers is that businesses are able to enforce disclaimers that are excessively one-sided.

Further, a fair number of consumers in South Africa have low literacy levels. This seriously hampers them when it comes to understanding the terms included in a business contract and the implications they will have. The low literacy level also means that they are unable to negotiate with business on equal terms particularly since most businesses use standard form contracts. This lack of understanding means that they are unaware of their rights and are not in a position to enforce them. However, even those consumers who have a fair literacy level may have little contractual experience or expertise to understand the nature and consequences of the terms and conditions included. Legal assistance is costly and a fair proportion of customers are unable to afford it. In addition, contracts are worded in language and in a
format that dissuades customers from reading them (Newman, 2010: 735).

The need for consumer protection legislation

In a free market economy, state intervention should be minimal. Hence, there is the danger that the protection of consumer rights through the law can go too far and it could interfere with the consumer’s free choice (Woker, 2010: 218). Woker (2010: 230 to 231) rejects the view that consumer protection legislation, such as the CPA, is unnecessary and that it will further burden the South African economy. The reasons she advances in support of such protective measures include:

1. Prior to the CPA, much of the consumer law in South Africa was fragmented and outdated;
2. South African consumers were denied the protection of internationally accepted consumer principles;
3. There were widespread unfair practices in consumer transactions;
4. When compared to traditional markets, the marketing of goods and services has become quite sophisticated, and untrained consumers are unable to compete with suppliers who insist that they contract on terms that protect the suppliers’ interests;
5. Consumers are placed in an ‘unequal bargaining position’ and when they confront suppliers with problems, they are usually ignored;
6. Consumers are unable to take the matter to court since they do not have the resources, bearing in mind that litigation is relatively expensive and the amounts generally involved in consumer-related disputes, are relatively small;
7. Checks, balances and safety nets are needed to make the free market work by protecting the interests of both business and consumers; and
8. Since international trade has now opened up, there is a need to ensure that South Africa does not become a dumping ground for unsafe and substandard products, and the consequent exploitation of consumers is avoided.

The consumer protection act (68 of 2008)

The preamble to the CPA recognizes that apartheid and discriminatory laws have resulted in “unacceptably high levels of poverty, illiteracy and other forms of social and economic inequality” and there is therefore a need to develop the means to assist historically disadvantaged individuals in realizing their full participation as consumers.

In addition, the need to develop the means to protect the interests of all consumers, as well as to “give effect to internationally recognized consumer rights”, is also acknowledged. How does the CPA protect the consumer in South Africa?

Fundamental consumer rights in terms of the consumer protection act

Chapter 2 of the CPA sets out nine fundamental consumer rights: equality in the consumer market; the right to privacy; the right to choose; the right to disclosure and information; the right to fair and responsible marketing; the right to fair and honest dealing; the right to fair, just and reasonable terms and conditions; the right to fair value, good quality and safety; and the right to hold the supplier accountable. A brief overview of these rights is as follows:

The right of equality in the consumer market: In terms of Section 8, businesses must not unfairly discriminate against consumers on the grounds set out in the South African Constitution (Republic of South Africa, 1996, Section 9), such as race, gender, disability, age and pregnancy. Business is not allowed to unfairly exclude any person from access to goods or services or grant anyone exclusive access; unfairly supply different quality of goods or services to consumers or unfairly charge different prices for any goods or services. Unfairly excluding certain communities or market segments, or targeting certain communities or market segments, is also prohibited. These provisions do not imply that businesses may not differentiate between different consumers or groups of consumers. Fair discrimination is allowed (Reddy, 2005: 133). The CPA makes exceptions for certain cases that may be viewed as fair discrimination, such as refusing to supply a minor with any particular goods or services without consent from the parent or guardian (Section 9).

The consumer’s right to privacy: The use of technology to market goods or services, such as the cell phone or even the telephone, could infringe on the consumer’s privacy or the time chosen to market such goods or services, could be unreasonable. The Act therefore places certain restrictions on direct marketing. “Direct marketing” is defined as approaching the consumer in person, by mail or electronic communications for the purpose of promoting or offering goods or services or for requesting a donation (Section 1). Section 11 of the Act gives the consumer the right to restrict unwanted marketing by refusing to accept such marketing, by requesting that it be discontinued or by pre-emptively blocking such communication. The consumer who has been approached for the purpose of direct marketing may demand that the person responsible for such direct marketing, desist from any further communication. To protect the privacy of consumers, Section 12 also prohibits direct marketing at the consumer’s home during certain days, dates, public holidays or times of the day which are prescribed by the Minister responsible for consumer protection matters (Havenga, 2010: 488).
The consumer’s right to choose: The consumer has the right to choose in respect of the following:

1. Right to select suppliers: Supplier may sometimes make it a condition of the contract, for instance when buying something, that the consumer has to buy other goods or services, or enter into additional agreements, or agree to buy any goods from other businesses or persons. This is also referred to as “bundling”. These conditions are prohibited in terms of Section 13 unless the supplier can show that the bundling is convenient or cost effective for the consumer.

2. Rights relating to expiry or renewal of fixed-term agreements: Consumers could be liable to unreasonable penalties or charges if they choose to cancel a contract before expiry. The Act now prohibits such practice (Section 14). The consumer has a right to cancel before expiry and may be liable to a reasonable cancellation penalty.

3. Right to pre-authorization of repair or maintenance: Suppliers may not charge consumers for repairs or maintenance unless the consumer was supplied with an estimate and the consumer has authorized the work (Section 15).

4. Right to cooling-off period in the case of direct marketing: Where the goods are sold by direct marketing, the consumer has a cooling-off period of five business days to cancel the agreement (Section 16).

5. Right to cancel advance reservations or booking: The consumer has the right to cancel advance reservations or bookings (Section 17). Suppliers may impose a reasonable charge for cancellation.

6. Right to choose or examine goods: Where the consumer buys from open stock, he or she may select or reject any item (Section 18).

7. Rights in respect of delivery of goods or supply of services: It is an implied condition of every contract for the supply of goods or services, that the seller agrees to deliver the goods or services at the agreed place and time, at his own cost and that the risk in the goods remains with the seller until delivered to the consumer (Section 19). The parties may agree to change these terms.

8. Right to return goods: The consumer will have the right to return the goods and claim a full refund in the following cases: where the agreement arose out of direct marketing and the consumer has cancelled; where the customer did not have an opportunity to examine the goods before delivery and has rejected delivery; and where the goods are unsuitable for the purpose intended and the supplier was aware of that (Section 20).

The consumer’s right to disclosure: The consumers right to disclosure is as follows:

1. The right to information in plain and understandable language: Newman (2010, 745) states that the literacy levels in South Africa are so low that the drafters of contracts have to accept the responsibility for making contracts more readable for consumers. He also states that contracts may contain onerous clauses written in fine print in unintelligible language and are inaccessible for the literacy level of most South Africans. Gouws (2010: 81) mentions that agreements may contain technical language which is incomprehensible for the consumer and that terms included are non-negotiable, usually one-sided, favouring the supplier.

The CPA (Section 22) has responded to these problems experienced by consumers regarding unreadable contracts. These provisions compel suppliers to draft contracts in “plain language”. Consumers have a right, in terms of Section 22, to information in plain and understandable language. In terms of this provision, any notice, document or visual presentation required by the Act must be in the form prescribed and if no form is prescribed, it must be in plain language. This would apply not only to contracts, but also to advertising material and notices displayed to consumers, particularly indemnity notices (Newman, 2010: 737).

2. Disclosure of price: Retailers may not display any goods for sale without displaying the price of the goods (Section 23). A supplier may not require the consumer to pay a higher price than the displayed price. If there is more than one price, the consumer will pay the lowest price.

3. Product labelling and trade descriptions: Suppliers are prohibited from using trade descriptions (which include description, number, weight, manufacturer, ingredients, or place of origin) that could mislead consumers (Section 24).

The consumer’s right to fair and responsible marketing: The Act aims to create fair business practices in respect of advertising. The provisions relating to the right to fair and responsible marketing, lays down general standards for marketing, and includes rules for specific types of marketing. Service providers are not allowed to market goods in a fraudulent, misleading or deceptive manner (Section 29). Bait marketing is also prohibited (Section 30). Suppliers are not allowed to advertise services as being available at a specific price and manner so as to mislead or deceive the consumer about the actual availability of such services (Havenga, 2010: 495).

Section 31 of the Act prohibits “negative option marketing”. Negative option marketing involves a practice where the supplier promotes goods or services on the basis that they will be supplied or the agreement will automatically come into existence “unless the consumer declines such offer”. For instance, books are mailed to a consumer with a letter stating that unless the books are returned within 30 days, a contract of sale will come into existence. Such transactions are now not allowed.

Where the goods are marketed through direct marketing, the consumer must be informed of the right to cancel within 5 days, that is, the cooling off right (Section
Section 33 places certain obligations on the supplier where goods or services are offered through catalogue marketing. The supplier has to disclose information including the supplier’s name, licence, registration number, physical business address, currency in which amounts are payable, supplier’s delivery arrangements, and cancellation, return and exchange policies. Section 34 prohibits promotional offers using trade coupons where the person making the offer does not intend fulfilling it or fulfilling it other than as offered. A promotional offer is one where any prize, gift, free good or service, price reduction or concession, is offered (Section 34 (2)). Section 35 contains a similar provision relating to customer loyalty programmes.

Right to fair and honest dealing: Certain acts which are regarded as “unconscionable conduct”, are disallowed by Section 40. The supplier is not allowed to use physical force against the consumer, coercion, undue influence, pressure, duress or harassment, unfair tactics or similar conduct in marketing, concluding the contract or claiming the return of goods. For instance, where the consumer who defaults, signs a voluntary repossession declaration under duress, this would be invalid. The supplier must not take advantage of the consumer’s physical or mental disability, illiteracy, ignorance, inability to understand the language of the contract or any other similar factor.

In the marketing of goods or services, the supplier must not use false or misleading representations, exaggerations, innuendo or ambiguity relating to a material fact concerning the contract (Section 41 (1)).

Right to fair, reasonable and just terms and conditions: The supplier is not allowed to offer or supply goods or services at a price or on terms that are unfair, unreasonable or unjust. They are also prohibited from marketing goods or services in an unfair, unreasonable or unjust manner. (Section 48; Naudé, 2009: 514 to 519). Section 48 also prohibits the supplier from requiring the consumer to waive any rights.

How will the parties know if the terms of the contract are unfair, unreasonable or unjust? A term or condition, or the agreement itself, will be regarded as unfair, unreasonable or unjust if it adversely affects the consumer in that it is excessively one-sided in favour of the supplier; so adverse to the consumer as to be inequitable; or it amounts to a false or misleading statement or is to the detriment of the consumer (Section 48 (2)).

Businesses would have to therefore re-examine their institutional rules, and terms and conditions of agreement, in order to determine whether they are fair or not. They would have to examine, for instance, the implications of breach of contract, as well as penalties imposed on the consumer. In determining whether terms in the contract are unfair or not, businesses must take into account the following factors.

According to Sharrock (2010, 308), a term or condition is not unfair simply because it is “one-sided” or favours the supplier in some way.

It has to do this “excessively”. He also states that the fact that one party held a superior bargaining position and was able to dictate terms, does not mean that such terms are unfair. Whether the terms were fair or not depends on whether one party obtained consensus (agreement) by taking advantage of the inability of the other party to protect his or her interests, such as being unable to take independent advice, or make an informed judgement, or conclude the contract elsewhere on better terms (Sharrock, 2010: 311).

Unfair clauses could also take the form of a disclaimer. Businesses usually include disclaimers in a contract. Such disclaimers could amount to unfair terms. Such disclaimers exclude or limit the liability of the business in certain circumstances.

However, in terms of the CPA, the parties to contracts will not be able to avoid liability for gross negligence or death, injury or illness, or the loss of or physical damage to, movable or immovable property, as well as any economic loss. Businesses will not be able to contract out of liability for gross negligence or death, injury or illness, or the loss of or physical damage to, movable or immovable property, as well as any economic loss. Although the CPA does not prohibit the use of disclaimers, it limits their scope of application and also makes it more difficult for a party to implement or rely on them.

Suppliers will have to spell out any limitation of liability in simple language which is understandable by the consumer. The limitation of liability must also be drawn to the consumer’s attention before the consumer concludes the transaction or is required to make payment. The consumer must also be given sufficient time to read and understand the disclaimer (McGee, 2010: 20).

Prohibited transactions, terms or conditions: In order to ensure that businesses do not include terms that are unfair or not in keeping with ethical business practices, certain provisions in an agreement between businesses and consumers would be invalid in terms of Section 51 of the CPA. These include: terms that defeat the purpose of the Act; terms that mislead or deceive the consumer; terms that result in the consumer waiving his/her rights; terms that exempts businesses from liability for any loss as a result of gross negligence on the part of the business; terms that bind the consumer into entering into another agreement; and terms that require the consumer to forfeit any money.

Right to fair value, good quality and safety: In the past consumers sometimes received goods or services where the value or quality was questionable. In other cases performance was not on time or safety standards were not met. The CPA therefore provides for protection of the
consumer in this respect. Consumers are entitled to timely performance and completion of those services, and timely notice of unavoidable delays. They also have a right to performance of the services in a manner and quality that a person is generally entitled to expect, taking into account the circumstances of the supply and the specific criteria and terms agreed upon (Section 54 (1)).

**A FOCUS ON THE RIGHT TO INFORMATION IN PLAIN AND UNDERSTANDABLE LANGUAGE**

The requirement of plain language, particularly in contracts and legal documents, is on the rise. Legal requirements for plain language are proliferating in the US, Canada, Europe and Australia. South Africa is no exception: new legislation, including the CPA, the Companies Act and the National Credit Act, makes plain language obligatory in many business and consumer documents (Gordon and Burt, 2010: 59).

Respect for the consumer has become important in South Africa since the launch of the CPA on the 1st April 2011. A new relationship has unfolded between the consumer and business. This relationship sees the consumer as being empowered, and therefore necessitates all documentation to be written in plain and understandable language.

In South Africa, even before the Act was passed, Parliament recognised the need for legislation dealing specifically with plain language and adopted several consumer protection statutes. Independent bodies such as the Banking Association of South Africa were also required to write their documentation in plain language (Gouws, 2010).

An apparent problem in South Africa is that consumers seldom read important terms when entering into a contract. A common reason is that consumers are more interested in obtaining the purchased product, rather than acknowledging the consequences of the purchase. They simply do not bother to read the long drawn out contract, because they trust the supplier or in most instances they are in a hurry to bother to read.

Newman (2010: 737) comments that, with the introduction of two very important pieces of consumer legislation, the National Credit Act 34 of 2005 and the CPA 68 of 2008, legislators have given effect to the widely held perception of unreadable contracts by including a section compelling drafter to write in “plain language” (Section 64 of the National Credit Act; and Section 22 of the CPA).

One of the basic principles applicable to contracts, “caveat subscriber”, implies that, where a person signs a contract, such person is bound by the terms in the contract even if it was signed without reading its content. In George v Fairmead (Pty) Ltd. (1958 (2): 465), a guest at a hotel signed the register without reading the accompanying terms and conditions. It was held that he was bound by such terms and conditions although he had not acquainted himself with them, as failing to read them did not amount to a reasonable mistake.

Apart from the fact that consumers do not take the time to read contracts prior to signing, there is also the issue of the disadvantaged consumer whose literacy levels are so low, that they cannot understand the content of contracts. Gouws (2010: 81) comments that agreements may contain technical language which is incomprehensible for the consumer and that terms included are non-negotiable, usually one-sided, and favours the supplier. Marginally, literate consumers are therefore at a disadvantage.

Gordon and Burt (2010: 59) demonstrate why the plain language requirement in our law, is necessary, through the case of Mathole v Mothle (1951 (1): 257):

Mothle, a farmer, agreed to be a guarantor for a debt owed by his brother-in-law. The plaintiff (a businessman) sued him for payment. The contract was in English, which was not Mothle’s home language. In court, Mothle attempted to raise the defence that the businessman must first proceed against the son-in-law to recover the debt. However, he had given up the right to raise this defence when he signed the contract. Mothle told the court that he had not read the contract. This argument was not accepted. The court stated that even if he had read the contract, he would not have known the meaning of the clause. Court held that the obligation to find out what the words meant was on Mothle. The court stated that if one of the parties did not, through his own ignorance or mistake, appreciate the agreement, there was no ground for setting the contract aside. This case demonstrates the unfairness of judgements where the “caveat subscriber” principle was applied.

This case also highlights the issue of compliance versus communication. Is it not the duty of the company to ensure that the customer understands the language in the contract?

Gordon and Burt (2010: 59) report that, at a 1995 seminar called “Plain language, the law and the right to information”, Dullah Omar, the Minister of Justice at the time, spoke about the transformation of justice and called for ‘plain, simple and understandable language’ in the country’s laws, in court judgements, in consumer documents, and in radio and television broadcasts. He referred to plain language as ‘democratising language’. They also point out that, since then, plain language is required by many laws in South Africa, including the Constitution of the Republic of South Africa (108 of 1996), Bill of Rights, Long-term Insurance Act (52 of 1998), Short-term Insurance Act (53 of 1998), National Credit Act (34 of 2005), CPA, and the Companies Act (71 of 2008).
What implications does this have for business from a communications perspective? It is evident from the foregoing that plain language has already been embedded in our laws. In South Africa the level of literacy (to understand business and legal documents) is low (Gordon and Burt, 2010: 60), thus making it essential for those responsible for drafting contracts to accept responsibility for making these contracts readable. This demands that business is obliged to inform and educate the disadvantaged consumer and to take responsibility for ensuring that they comply with plain language requirements. Hence, it requires businesses to draft all terms, and conditions in contracts in plain and understandable language. Their marketing and advertising practices need to be fair and honest, and understandable language. Under the law, whether or not the buyer understood its contents. The emphasis now is on communication, that is, the emphasis lay on compliance with the Act. A failure to comply can prove costly. Yet, businesses have to comply or face the imposition of stringent penalties. For instance, administrative fines (in respect of prohibited or required conduct) may be imposed up to one million rand or 10% of the respondent’s annual turnover, whichever is greater (Section 111). However, how these provisions will apply in the context of businesses is not clear.

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The need to develop the means to assist historically disadvantaged individuals in South Africa to realize their full participation as consumers is a very dire one. The CPA has far-reaching implications for business in South Africa. The “unacceptably high levels of poverty, illiteracy and any other forms of social and economic inequality” recognized by the Act, now makes it imperative for business to act in a socially responsible manner by following trade practices that are ethical, fair and reasonable. They have a legal duty to ensure that the terms and conditions in contracts are set out in plain and understandable language. Their marketing and advertising practices need to be fair and honest, and should facilitate access to goods and services, particularly for disadvantaged individuals.

In the past, it was sufficient if the business organization complied with the letter of the law regarding business contracts, that is, the emphasis lay on compliance with the law, whether or not the buyer understood its contents. The emphasis now is on communication, that is, the consumer must understand the meaning and impact of the contract. Further, the freedom to choose the content of a business contract is now a thing of the past, with legislative protection compensating for the weaker negotiating position of the consumer.

Business certainly has a role to play in ensuring that social and economic transformation change takes place in a society such as South Africa. Business needs to understand the provisions of the Act and how they apply to them. They need to scrutinize their current practices, policies and documentation to ensure that they comply with the Act. A failure to comply can prove costly. Yet, ethical and socially responsible business practices can contribute to profitability and growth, as well as to businesses gaining an ethical reputation and enhancing customer satisfaction and loyalty.

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Quantification of airlines business efficiency using data envelopment analysis (DEA)

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DEA-Data envelopment analysis is a mathematical programming technique, which is successfully used to quantify the efficiency of companies in the manufacturing and service sector. The technique essentially estimate ratio of input and output parameters of success - efficiency, in an implicit way and the result is the efficiency of business operations quantification or measurement. This result provides an opportunity to reveal advantages and disadvantages of business activities and processes, meet the business needs and requirements and to identify opportunities to improve current work and processes, on the basis of quantifying the efficiency. Analytic process that develops on the basis of these and the real input and output parameters in addition to objectivity in the quantification of efficiency, identifies best practices. This paper presents the application of DEA to measure efficiency of European airlines which annually transport five million passengers and which are members of the AEA organization. The first step is to quantify the level of efficiency based on real data and then, the ways to improve the efficiency of their work were recommended, for the inefficient ones.

Key words: Data envelopment analysis, efficiency, European airlines.

INTRODUCTION

Companies are subsystems of the economic system which suffer the influence of different factors aiming to reduce the reasonably possible business results. These factors are different causes of losses, with the core business problem boils down to mastering the impact of factors which cause losses. Seen from an organizational aspect, it can only be achieved by engaging the appropriate organizational potential - rationalization factors, aimed at regulating their impacts. These impacts can be complex and variable, depending on the conditions under which they manifest themselves, and therefore, the operating results undergo changes. What will be quality and quantity of this change depends on the contributing factors and the organization's ability to control their influence. Number of influential factors is theoretically unlimited, so the main task of the business organization is consisted of the quantification of their impact on the results of the company, or its efficiency. Ability to solve business problems is reflected in the capacity of resources, personnel, financial resources, the organization as a mechanism of operation, the structure of the business system and business performance. Certainly, the most important are the results of operations that essentially characterize the effectiveness of the organization. So, accordingly, the efficiency of operations, in the broadest sense, is achieved in two ways - minimizing the resources used to achieve the...
desired or stated goals and results and maximizing the results (output parameters/outputs) with a specific, available resources (input parameters/inputs). The transformation of input and output is done through a complex structure of the system. It is composed of a loop circuit retroactive effect which forms flow of material, money, labor, orders, equipment and information. Information flow connecting all other streams, because it contains decision-making criteria that affect changes in other elements of the state of flow. The decision is based on the knowledge of the range of information and decision making criteria that are defined on the basis of knowledge of the occurrence, or based on experience when it can be determined in advance.

Magnitude of changes, growth in round-return effects and the results of operations depend on quality. This means that a good decision may contribute to increased business productivity, setting the positive business focus. Often, making good decisions is not an easy task, primarily for large commercial systems which are characterized by a large number of input and output parameters of efficiency. For these reasons there is a need for the use of quantitative methods in the analysis of complex business systems operations and making decisions based on this analysis. Quantitative methods used for this purpose, most often represented by mathematical programming and mathematical analysis of the optimum problem. There is extensive literature on this issue, with a specific set of methods to quantify the efficiency of organizational units, called data envelopment analysis - DEA.

This analysis is an approach in mathematical programming, which had been successfully used in recent years to quantify the efficiency of companies in production and service sector. It is a process of defining criteria of valid comparisons between different organizational units in order to determine the relative positions of the observed organizational unit, and finally, in order to set the best benchmark, or the most appropriate benchmark. Quantifying efficiency helps businesses become more productive because it encourages a positive business units to continuously adapt and thrive in order to survive and develop in a business environment which is faced with global competition. DEA results provide opportunities so that top management can determine all the benefits and disadvantages of business activities and processes, better prepare organization to meet the business needs and requirements, and identify opportunities to improve current work and processes, and to create new products, services and processes, on the basis of quantifying the efficiency.

The concept of DEA methodology offers the possibility that this analysis is used successfully in manufacturing and service organizations. Because of its flexibility in the application, DEA became investigation theme for many authors dealing with the effectiveness of traffic in recent years. The conclusion is that continued research is needed to confirm or reject the discovered factors of inefficiency in this study. DEA in the sector of air transport had been applied by author (Duygun et al., 2000). Specifically, there are other numerous applications of DEA in traffic and transport. Thus, DEA is applied to public transport (Karlaftis, 2004; Yu and Fan, 2006), railways (Oum and Yu, 1994) and airports (Gillen and Lall, 1997).

DATA ENVELOPMENT ANALYSIS (DEA) APPROACH AND METHODOLOGY IN MEASURING THE BUSINESS EFFICIENCY

The idea of efficiency measurement was developed by Farrell during mid-twentieth century when he used the non-parametric efficiency limits approach to measure relative distances from border efficiency (Farrell, 1957). This measurement, which is well known as empirical or relative efficiency, was later expanded on by researchers, especially Charnes (Charnes et al., 1978). They called the technique data envelopment analysis or DEA. DEA makes it possible to measure efficiency using actual input and output parameters, where the concept of efficiency refers to empirical or relative efficiency (Cooper et al., 2000). It does not require knowledge of the specific functional forms of the input and output parameters, as opposed to other traditional statistical approaches. The advantage of DEA is its ability to address multiple input and output parameters that are diverse in nature (financial, technical, social, etc.), and which express themselves in different measurement units (Cook and Zhu, 2005).

In DEA terminology, business units, their activities or processes, are seen as decision making units–DMUs. A DMU is the unit that actually makes business decisions and whose performance is characterized by a set of inputs and outputs and their interdependence. Decision units are compared with the weights that are assessed using the same parameters and the larger the set of units, the more objective is the analytical process (Charnes et al., 1978; Ali and Lerma, 1995). Let us analyze a set of $n$ DMU observations. Each observation, DMU$_i$ $(i = 1, 2, 3, ..., n)$ uses $m$ inputs $x_{ij}$ $(i = 1, 2, 3, ..., m)$ to produce $s$ outputs $y_{ij}$ $(j = 1, 2, 3, ..., s)$. The efficiency limit of operations, or the Best Practice Line, as it is called, is determined by these $n$ observations, through the consistent application of the methodology which requires the realization of several steps.

The first stage in the DEA is the selection of the DMU whose efficiency is to be measured that is, the decision unit selection. It is necessary that the units, whose effectiveness is analyzed, are related to the same organizational unit (internal efficiency benchmarking), the same field or sector (competitive efficiency benchmarking), that is, care should be taken not to model mutually incomparable decision units. Only in certain special cases may decision units belong to different areas or sectors (Wei et al., 1995; Bhutta and Huq, 1999). Next, the efficiency of common business processes and activities for different areas or sectors within particular functional groups of organizations, such as administration, marketing, manufacturing, information links and the like, is measured and benchmarked (functional efficiency benchmarking). We should pay particular attention to the market conditions under which the selected decision units operate and exercise their activities.

The second stage of the DEA is defining the input and output efficiency parameters of the selected units of decision. The parameters are defined on the basis experience, theory and
practice in the given field, and depend on the specific business under consideration (Thanassoulis, 2001). The parameters should be defined as representatively as possible that is, parameters that best present the activities and processes to which they relate. Good input and output parameters can represent all resources (material, personnel, financial and information) that the decision units are using, in a credible way, as any realized results of its operations (Seiford and Zhu, 1998). If the parameters are not well-designed, this can lead to a superficial interpretation and to partially correct and incorrect conclusions about the efficiency of the observed unit of decision. Also, it is important that the values of the defined parameters are obtained from reliable sources and references, and remain uniform for all units that are compared.

In the third phase of efficiency calculation, an appropriate DEA model is selected, depending on the objectives and purposes of the research results (Liang et al., 2008). A number of calculations related to the quantification of efficiency, contributing factors and the analysis results require that the problem be defined by formulating and solving mathematical programming, with original or upgraded software for solving the DEA model (Cooper et al., 2000).

The fourth stage is the materialization of the previous three, where the most important thing is to interpret the results correctly. The results of the DEA include: Measuring the efficiency of the observed decision units, setting benchmarks for decision units that are inefficient, quantified parameters for reaching the limits of efficiency and other quantification in relation to comparing the efficiency of decision units. This is the stage which defines potential opportunities to improve operations, and implement the defined and selected improvements.

The main objective of this phase is to consolidate and strengthen the imperative of change. The researcher must be thoroughly familiar with the consequences and implications of the application possibilities related to business improvement and integration of the obtained findings and knowledge in the organization. This phase allows the adoption of strategic and management decisions and establishment of priorities in solving problems (Thanassoulis, 2001; Sherman and Zhu, 2006). The results and detailed analysis of the results provide many opportunities for decision makers to improve operations at least to the limits of efficiency.

DATA ENVELOPMENT ANALYSIS (DEA) MODELS FOR MEASURING THE BUSINESS EFFICIENCY

DEA is an effective tool for measuring the efficiency and for this purpose uses mathematical programming to assess the implicit relationships that is embedded in the empirical efficiency limit. DEA has developed into two distinct approaches for measuring the efficiency of operations. One is based on the input and the other on the output values. Therefore, in the first case we talk about the input-oriented and in the other about the output-oriented model for measuring the efficiency of operations.

Input-oriented data envelopment analysis (DEA) model

Input-oriented model for measuring the efficiency is based on minimizing the input values while keeping the output values constant.

\[
\theta^* = \min \theta
\]

with the constraints:

\[
\sum_{j=1}^{n} \lambda_j y_{ij} \geq y_{r0}, \quad r = 1, 2, 3, ..., m;
\]

\[
\sum_{j=1}^{n} \lambda_j = 1;
\]

\[
\lambda_j \geq 0, \quad j = 1, 2, 3, ..., n.
\]

DMU_0 is one of the DMUs which are being tested, and \( x_{i0} \) and \( y_{r0} \) are the \( i \)-th input and the \( r \)-th output of DMU_0. The DMU_0 is considered efficient if and only if the rating of efficiency \( \theta^* = 1 \) and the benchmarks \( \lambda_j = 0 \) for every \( j \), except DMU_0, for which \( \lambda = 1 \) (Charnes et al., 1994; Zhu, 2003).

Output-oriented data envelopment analysis (DEA) model

Output-oriented model for measuring the efficiency is based on maximizing the output variables with while the input values are kept constant.

\[
\phi^* = \max \phi
\]

with the constraints:

\[
\sum_{j=1}^{n} \lambda_j x_{ij} \leq x_{i0}, \quad i = 1, 2, 3, ..., m;
\]

\[
\sum_{j=1}^{n} \lambda_j y_{rj} \geq \phi y_{r0}, \quad r = 1, 2, 3, ..., s;
\]

\[
\sum_{j=1}^{n} \lambda_j = 1;
\]

\[
\lambda_j \geq 0, \quad j = 1, 2, 3, ..., n.
\]

DMU_j represent one of the DMUs which are estimated, \( x_{i0} \) and \( y_{r0} \) are \( i \)-th and \( r \)-th output for DMU_0, respectively, where DMU_0 is efficient if and only if holds that rating of efficiency \( \phi^* = 1 \) and benchmarks \( \lambda_j = 0 \) for any \( j \), except for DMU_0, where holds that \( \lambda = 1 \) (Charnes et al., 1994).

Both the input and output-oriented, assessing the effectiveness of operations and defining benchmarks for the inefficient DMU's, while not substantially vary their solutions. But neither of the models provide precise information on how to reduce the input and/or increase output efficiency parameters, so that inefficient DMU become efficient. This reduction of input and increase of output parameters in the DEA literature is defined as the input or output margins. Therefore, the DEA for this purpose has developed a model known as the Slack-based model (Zhu, 2003).
determines the type of the efficiency limit. Models 1 and 2 with 
constraint \( \sum_{j=1}^{n} \lambda_j = 1 \) represent models of variable returns to scale – VRS, and define VRS efficiency – the loose criterion of efficiency. 

If the restriction \( \sum_{j=1}^{n} \lambda_j = 1 \) is removed from Models 1 and 2, it produces the model of constant returns to scale – CRS, the one that defines the CRS efficiency. If the \( \sum_{j=1}^{n} \lambda_j \leq 1 \) constraint from the models 1 and 2 is replaced with \( \sum_{j=1}^{n} \lambda_j = 1 \), the it produces the model of non increasing returns to scale - NIRS, the one that defines NIRS efficiency. If the \( \sum_{j=1}^{n} \lambda_j \geq 1 \) constraint from the models 1 and 2 is replaced with \( \sum_{j=1}^{n} \lambda_j \geq 1 \), it produces the model of non decreasing returns to scale, the one that defines the NDRS efficiency – the most strict efficiency criterion. 

It should be noted that the VRS, CRS, NIRS and NDRS comprise a set of models known as Returns To Scale models – RTS (Figure 1). 

In Figure 1, is given six DMU’s: \( A_1, A_2, A_3, A_4, A_5 \) and \( A_6 \) with different efficiencies realized, that are within the RTS region outlined with input and output axes. Broken line shows \( A_1 A_2 A_3 A_5 A_6 \) VRS efficiency frontier consisting of NIRS (line \( A_1 A_2 \)) CRS (\( A_2 A_4 \)) and NDRS (\( A_4 A_5 \)) lines of efficiency, respectively. DMU’s \( A_1, A_2, A_3, A_4, A_5 \) and \( A_6 \) in addition to the VRS and NIRS, have CRS or NDRS efficiency, respectively. DMU \( A_2 \) is the VRS, NIRS and CRS efficient, and \( A_6 \) has a VRS, CRS and NDRS efficiency. Only DMU \( A_6 \) VRS is not efficient and therefore, is not efficient either in the other three criteria of efficiency.

**THE NUMERICAL EXAMPLE**

Implementation of a model for measuring the efficiency of business was conducted in eleven European airlines which annually transport up to five million passengers and which are members of the AEA organizations: Adria Airways (Slovenia), Air Malta (Malta), Brussels Airlines (Belgium), Croatian Airlines (Croatia), CSA (Czech Republic), Cuprus Airways (Cyprus), Jat Airways (Serbian), LOT (Poland), Luxair (Luxembourg), Malev (Hungary) and Tarom (Romania). Airline companies have been selected because of the uniformity of scale of operations that are realized in different ways, and therefore have different efficiency. The purpose of selection was not to compare mutually uncomparable airlines, so the sample consists only of those airlines which realized five million passengers on annual basis. They were taken from the list of AEA member organizations for reasons of equal reliability of the data. Three input and seven output variables were adopted, that characterize the efficiency of airlines - indicators are standardized, are taken from (Profile AEA, 2010) and presented in Tables 1 and 2. Input values are: Available seat kilometre - ASK (000000), Available tonne kilometre - ATK (000000) and number of employees. Outputs are: Number of passengers (000), revenue passenger kilometre - RPK (000000), revenue tonne kilometre - RTK (000000), passenger load factor (%), total load factor (%), income (000000 EUR) and profit (000,000 EUR).
RESULTS AND DISCUSSION

For measuring the efficiency and benchmarks $\lambda_j$ of inefficient airlines, Model 1 was chosen that focuses on the input parameters, whose results are given in Table 3 using the Excel Solver (Zhu, 2003).

The result of Model 1 shows that nine airlines of those eleven analyzed: Adria Airways, Air Malta, Brussels Airlines, Croatian Airlines, CSA, Cyprus Airways, LOT, Luxair and Malev, meet the necessary and sufficient efficiency constraint because they have ratings of efficiency and their own benchmark close to 1, while all the other benchmark $\lambda_j = 0$ for all $j = 1, 2, 3, ..., 11$. The two airline companies that perform poorly are: Jat Airways and TAROM.

Efficiency rating for Jat Airways equals $\theta^* = 0.855$, and benchmarks are:

$\lambda_1 = 0.674, \lambda_2 = 0, \lambda_3 = 0, \lambda_4 = 0.256, \lambda_5 = 0.008, \lambda_6 = 0.043, \lambda_7 = 0, \lambda_8 = 0.019, \lambda_9 = 0, \lambda_{10} = 0$ and $\lambda_{11} = 0$.

Efficiency rating for TAROM equals $\theta^* = 0.915$, and benchmarks are:

$\lambda_1 = 0.535, \lambda_2 = 0, \lambda_3 = 0, \lambda_4 = 0.234, \lambda_5 = 0, \lambda_6 = 0.079, \lambda_7 = 0, \lambda_8 = 0.089, \lambda_9 = 0.063, \lambda_{10} = 0$ and $\lambda_{11} = 0$.

The result of Model 1 shows that in the case of the inefficient airline JAT Airways benchmarks are first, fourth, fifth, sixth and eighth airline $\lambda_j > \lambda_{j+1} > \lambda_{j+2} > \lambda_{j+3} > \lambda_{j+4},$ meaning that the Adria Airways represent the best benchmark for the airline company JAT Airways, that is, the most acceptable performance benchmark. So, Jat
Table 3. Results of Model 1: Ratings of selected airlines efficiency.

<table>
<thead>
<tr>
<th>DMU Name</th>
<th>Input-Oriented VRS efficiency</th>
<th>Bench-marks</th>
<th>Bench-marks</th>
<th>Bench-marks</th>
<th>Bench-marks</th>
<th>Bench-marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adria Airways</td>
<td>1.00000</td>
<td>1.000</td>
<td>Adria Airways</td>
<td>1.00000</td>
<td>1.000</td>
<td>Air Malta</td>
</tr>
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<td>Air Malta</td>
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<td>Air Malta</td>
<td>1.00000</td>
<td>1.000</td>
<td>Brussels Airlines</td>
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<td>Brussels Airlines</td>
<td>1.00000</td>
<td>1.000</td>
<td>Brussels Airlines</td>
<td>1.00000</td>
<td>1.000</td>
<td>Croatian Airlines</td>
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<td>Croatian Airlines</td>
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<td>1.000</td>
<td>Croatian Airlines</td>
<td>1.00000</td>
<td>1.000</td>
<td>CSA</td>
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<td>CSA</td>
<td>1.00000</td>
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<td>Cyprus Airways</td>
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<tr>
<td>Cyprus Airways</td>
<td>1.00000</td>
<td>1.000</td>
<td>Cyprus Airways</td>
<td>0.256</td>
<td>0.008</td>
<td>CSA</td>
</tr>
<tr>
<td>Jat Airways</td>
<td>0.85456</td>
<td>0.674</td>
<td>Croatia Airlines</td>
<td>0.256</td>
<td>0.008</td>
<td>CSA</td>
</tr>
<tr>
<td>LOT</td>
<td>1.00000</td>
<td>1.000</td>
<td>LOT</td>
<td>1.00000</td>
<td>1.000</td>
<td>Luxair</td>
</tr>
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<td>Luxair</td>
<td>1.00000</td>
<td>1.000</td>
<td>Luxair</td>
<td>1.00000</td>
<td>1.000</td>
<td>Malev</td>
</tr>
<tr>
<td>Malev</td>
<td>1.00000</td>
<td>1.000</td>
<td>Malev</td>
<td>1.00000</td>
<td>1.000</td>
<td>TAROM</td>
</tr>
<tr>
<td>TAROM</td>
<td>0.91487</td>
<td>0.535</td>
<td>Adria Airways</td>
<td>0.234</td>
<td>0.079</td>
<td>Cuprus Airways</td>
</tr>
<tr>
<td>LOT</td>
<td>1.00000</td>
<td>1.000</td>
<td>LOT</td>
<td>1.00000</td>
<td>1.000</td>
<td>Luxair</td>
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<tr>
<td>Malev</td>
<td>1.00000</td>
<td>1.000</td>
<td>Malev</td>
<td>1.00000</td>
<td>1.000</td>
<td>TAROM</td>
</tr>
</tbody>
</table>

Airways should bring its input and output parameters of efficiency closer to the level of input and output efficiency parameters of Adria Airways. Similarly, the result shows that in the case of inefficient airline TAROM benchmark are: First, fourth, sixth, eighth and ninth airlines. $\lambda_1 > \lambda_4 > \lambda_8 > \lambda_6 > \lambda_9$, meaning that the Adria Airways represent the best benchmark for airline TAROM. Same as Jat Airways, Tarom should bring their input and output parameters of efficiency closer to the level of input and output efficiency parameters of Adria Airways.

The results of Model 3 were also obtained by using Excel Solver and they are the limits of input and output values for inefficient airlines. Input and output margins in the case of Jat Airways are:

- $s_1^- = 122.084$, $s_2^- = 156.103$ and $s_3^- = 1448$
- $s_1^+ = 39$, $s_2^+ = 0$, $s_3^+ = 3.662$, $s_4^+ = 1.966$, $s_5^+ = 20.562$, $s_6^+ = 0$ and $s_7^+ = 2.739$.

The obtained values for Jat Airways margins indicate that it should decrease its three input parameters of efficiency: Available seat kilometer, available tonne kilometer and number of employees, by 262.427 million, 26.014 million and 1307 million, respectively. The consequence of this rationalization will implicate corresponding increase in output efficiency parameter in the case of Jat Airways. The values of the first and second input margins suggest that the airline does not have adequate aircrafts adapted to passengers and goods transport and that transport passengers and cargo on routes that are not profitable. The value of the third input margin is unambiguous and means that the airline faces a surplus of 1307 employees. Interestingly, the value of the first output margin: the number of passengers is zero, which means that Jat Airways has a sufficient number of its passengers and that its main concern should not be an expensive campaign to get new customers, but rationalization of input parameters according to values of input margins.

If the other inefficient airline TAROM wants to become efficient it needs to decrease its three input parameters of efficiency: Available Seat Kilometer, Available Tonne Kilometer, and Number of employees, by 122.084 million, 156.103 million respectively and 1448 The consequence of this rationalization will suggest an increase of appropriate output parameters of performance of TAROM airline. The values of the first and second input margin are similar to those of JAT Airways, meaning that TAROM does not have adequate aircrafts adapted to passengers and goods transport, and that is realizing transport on routes that are not profitable. In addition, is is faced with a surplus of employees also. The output value of the first margin: the number of passengers was 39 thousands, which means besides rationalization of input efficiency
parameters. Tarom should try to win new passengers using adequate strategy, as a necessary constraint for operating on the efficiency limit.

**Conclusion**

Data envelopment analysis (DEA) is the contemporary method of operational research in the transport sector which is increasingly used for comparative efficiency analysis of entities (DMU) working under similar conditions and using the same types of inputs to produce the same kind of output. The paper shows how DEA can be applied as a useful management tool for assessing the efficiency and understanding the direction of improving airlines efficiency. Airline companies are listed according to different weights - a certain level of efficiency for the same parameters, which makes this analytic process more objective and allows identifying best practices in the process of benchmarking, on the basis of total production efficiency assessment. In addition, Model 1 and 2 quantify the efficiency of the observed DMU and set benchmarks for those who are inefficient, and provide examples of good operating practices for the inefficient DMUs. Model 3 provides complete information on the inefficiencies - efficient input/output levels for each inefficient unit which direct them becoming more efficient. Detailed analysis of results provide numerous opportunities for decision makers to improve operations at least to the limits of efficiency.

Limitation of the research is primarily reflected in the reliability of the data of which the model results directly depend on. Despite the fact that all data concerning airlines were taken from the AEA report, information taken from airlines themselves should be considered with care. The fact is that some airlines deliberately produce distorted data and therefore, the results do not reflect the true reality and true efficiency of the airline.

**THE CONTRIBUTION OF PAPER**

The authors in their work under title “Quantification of Airlines Business Efficiency Using DEA”, had the idea to quantify the empirical, that is, real efficiency of airlines. Eleven European airlines were selected, that are members of the AEA, and that realized the level of transport up to five million passengers a year. Airline companies are chosen on the basis of these two criteria for two reasons. One reason is that the reliability of data is the same for all airlines, and other to enter into the analysis of airline companies that are mutually comparable. The fact is that major airlines which annually transport more than five million passengers have different business systems totally incomparable with smaller airlines. The authors believe that large airlines are based more on power and prestige, and less on rationality, while the smaller airlines are forced to be more rational and depend less on power and prestige. Therefore, any attempt to compare small and large airlines is doomed to be unrealistic and unsuccessful, and the eventual results will certainly lead to erroneous interpretation. For this reason small airlines must be compared to ones of comparable size and large airlines to those of equal size to them.

The authors have selected small airline companies because they wanted to carry out the analysis of Serbian airline JAT Airways, which experienced a slight increase in performance during last few years, and compare it with other similar airlines. The results showed that the airline business is still inefficient, despite the growth in the volume of business. In addition to inadequate aircrafts and those inappropriate to their needs, the main problem JAT Airways is facing represent the excess of 1307 employees. If the management of the firm wishes to achieve its best benchmark - airline Adria Airways - it will have to conduct an internal analysis of the business, aimed at examining profitability of their routes, acquisition of other aircraft adequate to its needs and a different job classification. A result that is good for the airlines comes as value of first output margin, which means that Jat Airways attract a sufficient number of its passengers, and that its main concern should not be an expensive campaign to get new customers.

**REFERENCES**

A comparison of regular and franchise systems in the real estate brokerage industry in terms of operating efficiency—Application of the data envelopment analysis

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This study applied data envelopment analysis (DEA) to analyze the operating efficiency of Taiwan’s real estate brokerage firms and provides a reference for inefficient firms. The empirical results are the following: (1) through an analysis of the relative efficiencies, given their organizational management and distribution of resources, chain stores were found to more easily achieve efficiency than a franchise system; (2) using slack variable analysis, franchise systems were found to have considerable advertising expenses and lease and sales cases of houses, while regular chain stores have considerable rent cost and lease and sales cases of houses; and (3) based on a sensitivity analysis, the real estate brokerage industry has a higher sensitivity to commission revenue and a lower sensitivity to the salaries of non-salespersons.

Key words: Real estate brokerage industry, regular system, franchise system, data envelopment analysis, pure technical efficiency, scale efficiency.

INTRODUCTION

Cost studies are used to solve issues related to the performance of traditional firms. It is assumed that the performance of all of the firms is located on the efficiency frontier; otherwise, it is an X-inefficiency. X-innefficiencies mean that firms cannot achieve optimal economies of scale. Earlier studies suggest that firms that are small cannot reach scale efficiency (Anderson et al., 1998). Zumpano et al. (1993) and Zumpano and Elder (1994) employ a translog cost function to measure the production costs and economics of scale for real estate brokerage firms. Efficiency can be measured with a stochastic frontier approach. Lewis and Anderson (1999a, b) and Anderson et al. (1998) indicate that the real estate brokerage industry is close to the efficiency frontier. Since 1990, economic downturn in Taiwan has indirectly affected the real estate market resulting in a tendency of decrease in market concentration of the real estate brokerage industry and regional markets. This also indicates that the market tends to be competitive (Lee, 2000) and many real estate brokerages have been forced out of the market due to poor operating performance.

Regarding the comparison of franchise system and regular system, the selection of staffs in the franchise system is relatively loose as the personnel in charge of stores can hire staffs without the approval of the headquarters. In addition, teaching and education of staffs is less than that of the regular system. Moreover, due to the high bonus system for franchise system employees, more incentives to employees can result in relatively better business performance. In the respect of the regular system, all relevant operating costs should be...
borne by the headquarters. In particular, after the labor standards, law covers real estate employees. The headquarters have to bear relevant costs of employees resulting in increasing labor costs and operating pressures.

There are few in-depth studies relating to the operating performances of the regular system and franchise system of Taiwan’s real estate brokerage industry. Meanwhile, business performance is usually measured by business volume, cases of transaction, and business volume. In fact, these variables are inadequate as the weighting of them is often relatively subjective. It is unclear how to improve businesses of inefficiency. Hence, this study attempts to analyze the operating performance of the real estate brokerage industry.

In an investigation of the operating efficiencies of different business models for real estate and brokerage firms, Anderson et al. (1998) employ data envelopment analysis to measure X-inefficiencies and economies of scale. The empirical results indicate that the efficiency value of a real estate brokerage firm increases with its size and that this may lead to an increase in the size of the firm if a franchise model is selected.

Lewis and Anderson (1999b) apply Bayesian analysis and find that real estate brokerage firms participating in a franchise model have more efficient operating performance. Anderson et al. (2000) indicate that many real estate brokerage firms establish multiple departments and that the number of departments can affect operating efficiency. If real estate brokerage firms intend to achieve economies of scale, they should properly combine scale efficiency with production efficiency.

In terms of the recent studies on different business models for the real estate brokerage firms in Taiwan, Lee (1999) finds that the revenue generated by a franchise system is not greater than that of regular chain stores. Lee (2000) further finds no significant difference between the incomes of the employees of regular chains and a franchise system.

Lee and You (2007) discuss the performance of the employees in the real estate brokerage industry and the empirical results show that the performance of employees in regular chains is better than those in a franchise system. It may be inferred that the regular chain stores of real estate brokerage firms have better performance due to good brand image, a robust corporate system and the trust of buyers and sellers.

The primary empirical approach used for the study of firm performance is the regression analysis method. However, regression analysis has many weak points. This study proposed data envelopment analysis (DEA) as a method to assess the operating performance of domestic real estate brokerage firms. The method has two characteristics: (1) measuring several inputs and outputs and (2) measuring the efficiency of for-profit organizations and not-for-profit organizations. Data envelopment analysis can measure overall efficiency, identify components of allocative efficiency, technical efficiency, pure technical efficiency, and scale efficiency. As a result, it can measure the overall efficiency, pure technical efficiency and scale efficiency of regular chain stores and franchise stores of real estate brokerage firms.

The paper is organized as follows: Subsequently, the study provides an introduction. Thereafter, it described the empirical method and model. Next, it introduced the input and output variables and description of the data and also analyzes the empirical results and finally the study was concluded.

**EMPIRICAL METHODS AND MODEL**

**Efficiency evaluation methods**

The common efficiency measurement methods used in the empirical literature can be classified into two types: parametric frontier approaches and non-parametric frontier approaches. The former can be divided into deterministic production frontiers and stochastic production frontiers (Fried et al., 1993; Coelli et al., 1998). The main weak point of the production frontier method is that it cannot construct a convincing functional methodology, different functional settings, methods and residuals can cause the same empirical data to produce different estimated results. Moreover, a ratios approach is faced with the problem that different input to output ratios are aggregated by subjective weights.

Based on the efficiency measurement method described earlier, Farrell (1957) proposes a non-parametric frontier that does not have a preset functional form. Charnes et al. (1978) propose a model (constant returns to scale, CCR) that extends the single-output efficiency measurement model proposed by Farrell into a multi-output efficiency measurement model. This method uses a mathematical linear programming technique to construct a production function to measure efficiency; this is known as data envelopment analysis (DEA).

The Banker, Charnes, Cooper (BCC) model (which was named after the initials of Banker, Charnes, and Cooper,) suggested by Banker et al. (1984) further relaxes the assumption of constant return to scale and allows for variable returns to scale. Some important points that should be made regarding Banker, Charnes, Cooper are that no functional form is assumed before the analysis and data envelopment can address multi-input and multi-output efficiency evaluation issues. Moreover, data envelopment analysis does not need to consider the relative importance of input and output to determine subjective weights as well as the methods for ratio analysis and aggregation (Banker et al., 1989).

Having introduced and discussed different efficiency evaluation methods, data envelopment analysis model to evaluate operating efficiency was selected. The regression analysis method is often used for the study of performance; however, the regression analysis method has many disadvantages. Hence, this study adopts the data envelopment analysis method (Data Envelopment Analysis) to discuss the business performance of the domestic real estate brokerage industry. The two features of applying this method are: 1) it can measure multiple inputs and outputs; 2) it can be used to measure the efficiency of profit-making and non-profit making organizations. The data envelopment analysis method can be used to measure the overall efficiency level and distinguish the components of allocative efficiency, technical efficiency, pure technical efficiency and scale efficiency.

When employing a data envelopment analysis model, two points
DATA ENVELOPMENT ANALYSIS (DEA) MODEL

A brief description of the data envelopment analysis model used in this empirical analysis follows. It is assumed that the n evaluated decision-making units (DMU) use the m type of input-output variables (xij (i = 1, ..., m, j = 1, ..., n)) and produce the s type of output (yvr (r = 1, ..., n)). The basic concept suggested by Charnes et al. (1978) is to convert multi-inputs and multi-outputs pooled by a virtual multiplier (u, v) into a single input and a single output. The virtual input to output ratio serves as an indicator that measures the efficiency of the decision unit. The relative efficiency measurement indicator (h_o(u,v)) for decision unit 0 can be represented in the form of a CCR ratio form as:

\[
\begin{align*}
\text{Min } h_o(u,v) &= \frac{\sum_{j=1}^{m} v_j x_{oj}}{\sum_{r=1}^{s} u_r y_{0r}} \\
\sum_{j=1}^{m} v_j x_{ij} &\geq 1 \\
\sum_{r=1}^{s} u_r y_{ir} &\geq 1 \\
u_r, v_j &\geq 0, i = 1, ..., n, j = 1, ..., m, r = 1, ..., s
\end{align*}
\]

Equation (1) can calculate an infinite number of solutions. In other words, if the virtual multiplier (u, v) is an optimal solution, \(\forall \alpha > 0 (\alpha u^*, \alpha v^*)\), under the assumption of constant returns to scale, it is the optimal solution. To solve the problem with reference to the study by Charnes and Cooper (1962), let \((u,v)\) satisfy \((u^*, v^*)\), and convert the fractional programming problem in Equation (2) into a linear programming problem:

\[
\begin{align*}
\text{Max } & \phi & & \phi y_{0r} - \sum_{i=1}^{n} \lambda_i y_{0r} &\leq 0 \\
\text{S.T. } & & & \lambda_i x_{ij} &\leq x_{0j} \
\end{align*}
\]

In Equation (2), the first constraint condition means that the input, \(\sum_{i=1}^{n} \lambda_i x_{ij}\) virtualized by the weighted multiplier of a decision unit in the reference set, is smaller than or equal to input \((\phi y_{0r})\) of the evaluated decision unit. The second constraint condition means that the decision unit’s input, \(\sum_{i=1}^{n} \lambda_i x_{ij}\), should be equal to the output variable \((\phi y_{0r})\) of the evaluated decision unit using a determined \(\phi\). The variable \(\phi\) is an indicator measuring the relative efficiency of the evaluated decision unit and is always greater than or equal to 1. When \(\phi = 1\), the decision unit has operating efficiency, while when \(\phi > 1\), the decision unit has no operating efficiency.

Different DEA models are presented using the multiplier constraints proposed by Banker et al. (1984). When the constraint \((\sum_{i=1}^{n} \lambda_i x_{ij} = 1)\), it signifies the VRS (variable returns to scale), that is, the banker Charnes, Cooper model. When the constraint \((\sum_{i=1}^{n} \lambda_i x_{ij} = 0)\), it signifies NIRS (non-increasing return to scale); if there is no constraint, this signifies CRS (constant return to scale), i.e., the CCR model.

SELECTION OF THE INPUT AND OUTPUT VARIABLES AND A DESCRIPTION OF THE DATA

Selection of the input and output variables

In selecting input and output variables, one is faced with a choice of several variables that affect the operating efficiency of the real estate brokerage industry. Data envelopment analysis consists of the most efficient decision-making unit and additional input and output may affect the efficiency frontier. Selecting too many variables may lower the identification capability of data envelopment analysis.

The input variables used in past studies on the performance of the real estate brokerage industry include the following: the number of salespersons, the number of non-salespersons personnel, the area of storefront, the salary of salespersons and non-salespersons, advertising and bonus expenditure, whether the firm uses a franchise system, the number of chain stores, and other expenses.

Output variables have included commission revenue and transactions (Zumpano et al. 1993; Zumpano and Elder, 1994, 1998; Lewis and Anderson, 1999a, b; Anderson et al. 2000). In addition, Lee (1999) employs the discount rate concept suggested by Blair and Kaserman (1982) to construct a theoretical model to address the form of the business of real estate brokerage industry. The empirical variables included the age of brokerage firms, the number of salespersons, the number of chain stores, and whether the firm uses a franchise system, the number of chain stores, and other expenses.

In literature, Zumpano et al. (1993), Zumpano and Elder (1994, 1998), Lewis and Anderson (1999a, b), and Anderson et al. (2000)… used input variables including number of salespersons, the number of non-salespersons personnel, the area of storefront, the salary of salespersons and non-salespersons, advertising and bonus expenditure, whether the firm uses a franchise system, the number of chain stores, and other expenses in the assessment of the performance of real estate brokerage. The output variables included commission revenue and
transactions. In addition to reference in the relevant literature, this paper considers the status of Taiwan's real estate brokerage industry and integrates rent of chain store, lease and sales cases of houses, experience of salespersons and experience of non-salespersons as the input variables.

Based on a review of the literature, this research uses input variables from previous studies. We include the area of the storefront, the annual salary of non-salespersons, the annual salary of salespersons, advertising and sales promotion expenses, the annual rent of the storefront, the number of non-salespersons, the number of salespersons, lease and sale cases, and the average experience of salespersons and non-salespersons. The output variables include transaction cases and commission revenues. The input and output variables are defined in Table 1.

When data envelopment analysis is used for efficiency evaluation, increases in each input/output variable can decrease the degree of identification of a data envelopment analysis. If there are four inputs and five outputs, 20 input to output ratios can be deduced. In theory, two or more decision-making unit should exist such that the identification capability of these models can be evaluated.

Golany and Roll (1989) propose a rule for data envelopment analysis. The number of evaluated decision units should be two times the sum of the input and output variables. A total of 12 input and output variables were selected for this paper. After the collection of the questionnaires, a total of 62 of the available decision-making unit were selected. This is consistent with the data envelopment analysis rule suggested by Golany and Roll (1989). DEAP software (Version 2.1) is used for our analysis.

**Data description**

The business models employed by Taiwanese real estate brokerage firms can be divided into regular chains and the franchise system. In a regular chain, the headquarters selects an employee to manage a store. The relevant resources and operating expenses of the regular chains are supported by headquarters.

In a franchise system, the franchiser uses the services, operating method, brand or service mark and pays a franchise fee to found the franchise. Each franchiser supports the relevant operating expenses.

This study investigates prominent real estate brokerage firms, large real estate houses and real estate brokerage firms. Questionnaires were sent by post and a total of 97 questionnaires were collected. Of these, 62 questionnaires were received. The 62 stores are from seven real estate firms. The regular chain stores are Sinyi Realty Inc. stores, and the franchise stores include H and B Realty, China trust Real Estate Co., ET Home Real Estate Corporation, Century 21 Realty, George Realty and Pacific Rehouse Co stores. The sample statistics for the real estate brokerage firms are presented in Table 2.

**EMPIRICAL RESULTS AND ANALYSIS**

**Outliers test**

This study employed the jackknife sampling suggested by Färe et al. (1989) to test whether an outlier affects an efficiency value. In terms of the test results, the influence range is lower than 2%, which means that the influence of any one decision-making unit is not too great and does not create outliers.

**Relative efficiency analysis**

This study used the constant returns to scale and Banker, Charnes, Cooper models for data envelopment analysis to calculate pure technical efficiency, scale efficiency and overall efficiency. Regarding allocative efficiency, input and output prices may fluctuate with changes in supply and demand in the market. When data envelopment analysis is used to estimate efficiency, a serious deviation may occur.

Therefore, Farrell does not suggest using data envelopment analysis to estimate the allocative efficiency of decision units. In constant returns to scale, it is assumed that technical efficiency is the overall efficiency under constant returns to scale. In Banker, Charnes, Cooper, it is assumed that technical efficiency calculated under variable returns to scale is pure technical efficiency. The overall efficiency divided by pure technical efficiency is scale efficiency.

Table 3 shows the relative efficiency values of the real estate brokerage firms. For overall efficiency, the average value is approximately 0.88. Sinyi Realty Inc. has the best efficiency (0.96); Century 21 Realty has the lowest efficiency (0.61).

For pure technical efficiency, the average value corresponds to the most efficient unit (0.98). Sinyi Realty Inc., China trust Real Estate Co. and ET Home Real Estate Corporation has relative efficiency (0.99). Other real estate brokerage firms also have good efficiency, and there is no significant difference between the firms. Regarding scale efficiency, the average efficiency value is 0.89. Sinyi Realty Inc. has the relative efficiency (0.97), and Century 21 Realty has the lowest relative efficiency (0.62).

Furthermore, a statistical test was conducted on the difference in the efficiency values between each real estate firm. There are seven firms in this paper meaning three or more populations. Hence, this study performs the Kruskal-Wallis test for statistical significance. In terms of the test results in Table 4.

The overall and scale efficiencies of each firm reach the 5% significant level. Technical efficiency does not reach the 5% significant level. The results indicate that the overall and scale efficiency values for all of the real estate firms are significant.

As can be observed, the overall and scale efficiency of Sinyi Realty Incorporated which uses the regular chain system, is higher than the real estate firms that use the franchise system.

**Slack variable analysis**

The data envelopment analysis can use slack variable analysis to provide input and output improvement orientations for non-efficient real estate brokerage firms and help them achieve an efficient situation.
Table 1. Definitions of input and output variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Variable definition</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area of storefront</td>
<td>Area of chain store</td>
<td>Acreage</td>
</tr>
<tr>
<td>Salary of non-salesperson</td>
<td>Salary of non-salesperson in each chain store</td>
<td>NT$ 10,000</td>
</tr>
<tr>
<td>Salary of salesperson</td>
<td>Salary of broker and sales assistant in each chain store</td>
<td>NT$ 10,000</td>
</tr>
<tr>
<td>Advertising expense</td>
<td>Advertising and sales promotion expenses from commission sales to completion of sales</td>
<td>NT$ 10,000</td>
</tr>
<tr>
<td>Rent of chain store</td>
<td>Annual storefront rent of each real estate agent</td>
<td>NT$ 10,000</td>
</tr>
<tr>
<td>Number of salespersons</td>
<td>Number of brokers and sales assistants of each real estate brokerage firm</td>
<td>No. of person</td>
</tr>
<tr>
<td>Number of non-salespersons</td>
<td>Number of administrative employees of each real estate brokerage firm</td>
<td>No. of person</td>
</tr>
<tr>
<td>Lease and sales cases of houses</td>
<td>Lease and sales cases of houses received by real estate brokerage firm per year</td>
<td>No. of person</td>
</tr>
<tr>
<td>Sales seniority</td>
<td>Average seniority of brokers or sales assistants</td>
<td>Year</td>
</tr>
<tr>
<td>Non-sales seniority</td>
<td>Average seniority of administrative persons</td>
<td>Year</td>
</tr>
<tr>
<td><strong>Output variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transaction case</td>
<td>Buyer or tenant willing to purchase or rent the house of real estate brokerage firms</td>
<td>Number of cases</td>
</tr>
<tr>
<td>Commission revenues</td>
<td>Commission revenues from sales or lease of houses, obtained by the real estate brokerage firms</td>
<td>NT$ 10,000</td>
</tr>
</tbody>
</table>

Remark: Total (NT$).

Generally, slack variable analysis can use the constant returns to scale and Banker, Charnes, Cooper models. The slack variable calculated by the former is the suggestion for long-term effort, and the slack variable calculated by the latter is the suggestion for short-term effort. This study uses...
Table 3. Relative efficiency of real estate brokerage firms.

<table>
<thead>
<tr>
<th>Firm</th>
<th>Overall efficiency</th>
<th>Pure technical efficiency</th>
<th>Scale efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinyi Realty Inc.</td>
<td>0.96</td>
<td>0.99</td>
<td>0.97</td>
</tr>
<tr>
<td>H and B Realty</td>
<td>0.79</td>
<td>0.96</td>
<td>0.81</td>
</tr>
<tr>
<td>Century 21 Realty</td>
<td>0.61</td>
<td>0.98</td>
<td>0.62</td>
</tr>
<tr>
<td>Pacific Rehouse Co.</td>
<td>0.90</td>
<td>0.98</td>
<td>0.91</td>
</tr>
<tr>
<td>Chinatrust Real Estate Co.</td>
<td>0.93</td>
<td>0.99</td>
<td>0.93</td>
</tr>
<tr>
<td>ET Home</td>
<td>0.95</td>
<td>0.99</td>
<td>0.96</td>
</tr>
<tr>
<td>George Realty</td>
<td>0.81</td>
<td>0.95</td>
<td>0.86</td>
</tr>
<tr>
<td>Total</td>
<td>0.88</td>
<td>0.98</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Table 4. Kruskal-Wallis test.

<table>
<thead>
<tr>
<th>Firm</th>
<th>Average of overall efficiency grade</th>
<th>Average of pure technical efficiency grade</th>
<th>Average of scale efficiency grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinyi Realty Inc.</td>
<td>40.00</td>
<td>32.00</td>
<td>40.00</td>
</tr>
<tr>
<td>H and B Realty</td>
<td>25.31</td>
<td>29.69</td>
<td>25.38</td>
</tr>
<tr>
<td>Pacific Rehouse Co.</td>
<td>30.75</td>
<td>26.00</td>
<td>30.75</td>
</tr>
<tr>
<td>Chinatrust Real Estate Co.</td>
<td>36.10</td>
<td>33.60</td>
<td>36.30</td>
</tr>
<tr>
<td>ET Home</td>
<td>37.08</td>
<td>35.17</td>
<td>37.11</td>
</tr>
<tr>
<td>21 Century</td>
<td>10.63</td>
<td>21.75</td>
<td>10.25</td>
</tr>
<tr>
<td>George Realty</td>
<td>22.33</td>
<td>37.00</td>
<td>21.67</td>
</tr>
</tbody>
</table>

input orientation for calculation and thus more improvement orientations are displayed for the input variables. The Banker, Charnes, Cooper model with a variable scale is used. The judgment criterion for an input variable is a reduced input variable and for the output variable is an increased output variable.

Table 5 shows a comparison of the business models. As we have seen, the regular chain stores of Sinyi Realty Inc. too many lease and sales cases of houses and rent due to the creation of a brand image. The location of regular chain stores is very important and the rent at better locations is higher. In the franchise system, H and B Realty has high expenses; first, it has too many lease and sales cases of houses, followed by its high salary for salespersons and advertising expenses.

Real estate brokerage firms have to pay fixed advertising expenses and marketing costs to increase the exposure of developments and transaction opportunities when a real estate firm sells houses. Century 21 Realty has lower commission revenue and fewer transactions. Pacific Rehouse Co. has too many lease and sales cases of houses, and the rent for branch offices is obviously too high. ET Home spends too much on advertising. Chinatrust Real Estate Co. also has considerable advertising expenses. George Realty should reduce advertising expenses and increase commission revenues. The above describes improvement orientations for the real estate brokerage firms. If the real estate brokerage firms are able follow the improvement orientations, they will be able to achieve relative efficiency.

Sensitivity analysis

Data envelopment analysis is very sensitive to the input and output variables that are selected for a data set. Thus, sensitivity analysis was conducted to understand what effect an increase or decrease of input and output has on relative efficiency to determine the accuracy of this study. Table 6 illustrates a sensitivity analysis of the overall efficiency of real estate brokerage firms. Generally, the average overall efficiency of the original data envelopment analysis is 0.85. If the commission revenue is eliminated, the average overall efficiency is 0.68 and the change in efficiency value change is greater. If the salary of non-salespersons is eliminated, the average overall efficiency is 0.85, and amount of variation remains the same. Real estate brokerage firms have a high sensitivity to commission revenues and a low sensitivity to the salary and number of non-salespersons.

Conclusions

This study investigated both regular chain stores and
Table 5. Slack variable analysis of real estate brokerage firms.

<table>
<thead>
<tr>
<th>Firm</th>
<th>Transaction case</th>
<th>Commission revenue</th>
<th>Sales person</th>
<th>Non-salesperson</th>
<th>Area of store</th>
<th>Salary of salesperson</th>
<th>Salary of non-salesperson</th>
<th>Advertising expense</th>
<th>Rent of chain store</th>
<th>Sales experience</th>
<th>Non-sales experience</th>
<th>Lease and sales cases of houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinyi Realty Inc.</td>
<td>1.27</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.10</td>
<td>1.01</td>
<td>0.58</td>
<td>0.73</td>
<td>2.47</td>
<td>0.05</td>
<td>0.22</td>
<td>14.20</td>
</tr>
<tr>
<td>H and B Realty</td>
<td>3.81</td>
<td>10.17</td>
<td>0.68</td>
<td>0.14</td>
<td>2.70</td>
<td>26.26</td>
<td>1.78</td>
<td>16.61</td>
<td>4.61</td>
<td>0.23</td>
<td>0.66</td>
<td>36.46</td>
</tr>
<tr>
<td>Century 21 Realty</td>
<td>10.98</td>
<td>62.49</td>
<td>0.39</td>
<td>0.00</td>
<td>0.00</td>
<td>6.74</td>
<td>0.39</td>
<td>0.00</td>
<td>5.73</td>
<td>0.45</td>
<td>0.02</td>
<td>2.46</td>
</tr>
<tr>
<td>Pacific Rehouse Co.</td>
<td>1.65</td>
<td>13.04</td>
<td>0.28</td>
<td>0.00</td>
<td>1.03</td>
<td>2.53</td>
<td>1.11</td>
<td>5.00</td>
<td>7.47</td>
<td>0.01</td>
<td>0.58</td>
<td>38.04</td>
</tr>
<tr>
<td>Chinartrust Real Estate Co.</td>
<td>0.64</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>0.33</td>
<td>0.00</td>
<td>0.54</td>
<td>17.67</td>
<td>1.06</td>
<td>0.05</td>
<td>0.02</td>
<td>12.96</td>
</tr>
<tr>
<td>ET Home</td>
<td>0.01</td>
<td>3.17</td>
<td>0.02</td>
<td>0.00</td>
<td>0.95</td>
<td>0.57</td>
<td>0.16</td>
<td>6.31</td>
<td>1.16</td>
<td>0.08</td>
<td>0.21</td>
<td>1.60</td>
</tr>
<tr>
<td>George Realty</td>
<td>2.31</td>
<td>26.70</td>
<td>0.55</td>
<td>0.27</td>
<td>4.26</td>
<td>3.09</td>
<td>4.27</td>
<td>10.06</td>
<td>0.00</td>
<td>1.07</td>
<td>1.12</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>2.06</td>
<td>10.06</td>
<td>0.24</td>
<td>0.05</td>
<td>1.34</td>
<td>6.68</td>
<td>0.94</td>
<td>9.37</td>
<td>3.08</td>
<td>0.17</td>
<td>0.35</td>
<td>16.64</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>DMU</th>
<th>Original overall efficiency</th>
<th>Elimination of transaction case</th>
<th>Elimination of commission revenue</th>
<th>Elimination of number of sales persons</th>
<th>Elimination of non-sales persons</th>
<th>Elimination of area of store</th>
</tr>
</thead>
<tbody>
<tr>
<td>H and B Realty</td>
<td>0.79</td>
<td>0.72</td>
<td>0.58</td>
<td>0.75</td>
<td>0.78</td>
<td>0.78</td>
</tr>
<tr>
<td>Pacific Rehouse Co.</td>
<td>0.90</td>
<td>0.83</td>
<td>0.61</td>
<td>0.87</td>
<td>0.88</td>
<td>0.88</td>
</tr>
<tr>
<td>ET Home</td>
<td>0.95</td>
<td>0.84</td>
<td>0.89</td>
<td>0.93</td>
<td>0.95</td>
<td>0.94</td>
</tr>
<tr>
<td>George Realty</td>
<td>0.82</td>
<td>0.70</td>
<td>0.74</td>
<td>0.81</td>
<td>0.82</td>
<td>0.82</td>
</tr>
<tr>
<td>21 Century</td>
<td>0.61</td>
<td>0.49</td>
<td>0.49</td>
<td>0.56</td>
<td>0.60</td>
<td>0.61</td>
</tr>
<tr>
<td>Chinartrust Real Estate Co.</td>
<td>0.92</td>
<td>0.88</td>
<td>0.76</td>
<td>0.91</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Sinyi Realty Inc.</td>
<td>0.96</td>
<td>0.95</td>
<td>0.72</td>
<td>0.94</td>
<td>0.96</td>
<td>0.96</td>
</tr>
<tr>
<td>Total</td>
<td>0.85</td>
<td>0.77</td>
<td>0.68</td>
<td>0.82</td>
<td>0.85</td>
<td>0.83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DMU</th>
<th>Elimination of salary of salespersons</th>
<th>Elimination of salary of non-salespersons</th>
<th>Elimination of advertising expense</th>
<th>Elimination of rent of chain store</th>
<th>Elimination of sales experience</th>
<th>Elimination of non-sales experience</th>
<th>Elimination of lease and sales cases of houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>H and B Realty</td>
<td>0.79</td>
<td>0.79</td>
<td>0.76</td>
<td>0.77</td>
<td>0.78</td>
<td>0.78</td>
<td>0.76</td>
</tr>
<tr>
<td>Pacific Rehouse Co.</td>
<td>0.86</td>
<td>0.90</td>
<td>0.89</td>
<td>0.90</td>
<td>0.87</td>
<td>0.90</td>
<td>0.89</td>
</tr>
<tr>
<td>ET Home</td>
<td>0.95</td>
<td>0.95</td>
<td>0.93</td>
<td>0.92</td>
<td>0.94</td>
<td>0.94</td>
<td>0.94</td>
</tr>
<tr>
<td>George Realty</td>
<td>0.78</td>
<td>0.82</td>
<td>0.82</td>
<td>0.76</td>
<td>0.82</td>
<td>0.80</td>
<td>0.76</td>
</tr>
<tr>
<td>21 Century</td>
<td>0.60</td>
<td>0.61</td>
<td>0.60</td>
<td>0.59</td>
<td>0.59</td>
<td>0.59</td>
<td>0.58</td>
</tr>
<tr>
<td>Chinartrust Real Estate Co.</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
<td>0.91</td>
<td>0.92</td>
<td>0.92</td>
<td>0.91</td>
</tr>
<tr>
<td>Sinyi Realty Inc.</td>
<td>0.96</td>
<td>0.96</td>
<td>0.93</td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
</tr>
<tr>
<td>Total</td>
<td>0.84</td>
<td>0.85</td>
<td>0.83</td>
<td>0.83</td>
<td>0.84</td>
<td>0.84</td>
<td>0.83</td>
</tr>
</tbody>
</table>
franchisers of well-known real estate brokerage firms and applies data envelopment analysis to evaluate the operating performance of the real estate brokerage firms. The empirical results showed that the overall efficiency, pure technical efficiency and scale efficiency of the regular chain stores belonging to Sinyi Realty Inc. are higher than those of other real estate brokerage firms, especially scale efficiency.

This indicates that the number of regular chain stores operated by Sinyi Realty Inc. is determined through a rigorous market analysis. Moreover, pure technical efficiency can grow and relative efficiency can be achieved as regular chain stores pay more attention to brand image. In the franchise system, franchises are opened by the franchiser and are not approved by headquarters. The franchise system has a flexible mechanism for the selection of franchisers and the education and training are weaker than at the regular chains. This may affect long-term overall efficiency.

Data envelopment analysis can use slack variable analysis to provide input and output improvement orientations for non-efficient real estate brokerage firms and make them efficient. From the results of the analysis, regular chain stores have considerable lease, sales cases of houses and high rent costs potentially because the expansion speed of regular chain stores of real estate brokerage firms is slower than that of a franchise system. To create a brand image, the location of regular chain stores is important.

The franchise stores have considerable lease and sales cases of houses and advertising expenses because real estate brokerage firms have to pay fixed advertising expenses and marketing cost to increase the exposure of lease and sales cases of houses when a real estate firm sells houses. Real estate brokerage firms have a high sensitivity to commission revenues and a low sensitivity to the salary and number of non-salespersons.

This study proposes that the franchise system has room to improve the utilization of its resources, technical research and organizational management. The regular chain stores have high rent costs and should reduce them to achieve optimal efficiency. Moreover, a Data envelopment analysis is sensitive to the choice of data. Future studies can use data from government organizations for analysis.

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Designing and implementing of balanced scorecard system in educational systems: Results obtained from a case study in Iranian universities

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Nowadays, universities are essential parts of educational systems. Till now, various models with different approaches to strategic positioning are deployed in defining the strategic position within the various industries. Balanced scorecard (BSC) as one of the powerful models for strategic positioning, analyzes all aspects of the organization evenly. In this paper BSC may be used as a tool to make the university more efficient and effective in implementing vision mission of organization, strategic and performance measurement on faculty, department or even supporting department strategic plan. So, the purpose of this article is to design and implement the balance scorecard system in Iranian educational organizations (especially universities) to improve efficiency of them.

Key words: Balance scorecard system, design and implementation, educational systems.

INTRODUCTION

In late 1980s, lots of articles were published in management magazines in America and Europe about the inefficiency of different performance measurement tools at companies (Namazi, 2006). In 1987 researches were made by National Association of Accountants (NAA) and Computer Aided Manufacturing-International (CAM-I) institute in America. The balanced scorecard (BSC) is one of the performance measurement tools that determine intangible assets of the organization. This system is used more frequently in strategic planning than that in performance assessment. Due to the long domination of traditional management approaches in Iranian educational systems, they seldom use a balanced performance measurement tool. Most of them use the financial measures only. This unbalanced system forces the organization not to pay attention to its intangible assets. After giving general descriptions about BSC, this article shows the design and implements balance scorecard system in educational systems.

What is a balanced scorecard?

The balanced scorecard (BSC) is a performance measurement tool originated in the business world. Performance measurement is a method of tracking performance over time to assess if goals are being met. The BSC was introduced by Robert Kaplan, and David Norton, the founders of balanced scorecard. In the early 1990s as a new way to measure business performance, organizations measured their performance to monitor how they achieve their overall mission and goals. Traditionally, companies measured their performance by looking only at how they were doing financially, for example measuring only profit increases or cost efficiency. Kaplan and Norton’s BSC concepts challenged this traditional, single focused approach to performance measurement (Kaplan and Norton, 1996).
Selecting a suitable organizational unit

Criteria for selecting a suitable organizational unit

Some criteria need to be considered for important decision before concluding that a balanced scorecard system is the best option at high level for you. A variety of elements help us to select an appropriate organizational for the first balanced scorecard system. These criteria are shown in Figure 1.

Strategy

The most important criterion is that if the desired unit has a clear and coherent strategy, the method of a balanced system is a special method designed to help you to interpret your strategies to the objectives and measures having the capacity of controlling. Without strategy, it would be like as a set of financial and non-financial measures are collected so that they have no connection to each other.

Need of a balanced system

Answer to this question is needed in order for the desired unit to have a specified objective for implementing the balanced system.

The possibility of providing information

This criterion refers to two subjects. First, does a desired unit have a culture of performance assessment? Although any group in a modern organization should rely on the measures and performance criteria, the assessment of this issue is relatively difficult. It is because some of the measures of a balance system are probably new and their required data resources are probably undefined. However if the desired unit has some problems in providing the data related to the current performance measures, it will certainly have some problems in providing the data related to the balanced scorecard system.

Resources

To implement, a unit should be selected to have the possibility of providing information. For this reason and considering this point that if the performance appraisal of a university is done through the method of effectiveness, the university may use the internal strength points to make benefit from the internal opportunities, identify the threats, defend them and finally before becoming harmful of internal weakness point, decrease its power. Because of the defects in the present methods of performance appraisal, the performance may not be evaluated accurately, so the managers will not be able to make decision accurately with respect to the evaluation. In order to remove this problem, the balanced scorecard system allows a university to interpret and evaluate the strategies and views based on a special pattern.

Regarding the available resources and adequate information and precise strategies (second stage of implementation) and the requirement to the method of balanced evaluation mentioned earlier and the great share of university and academies (including the students, professor and staff) a suitable balanced scorecard approach was identified.

General evaluation of Table 1: This unit has attained a very high score (8.8 from 10) and therefore it is a good candidate for implementing the method of balanced scorecard.
Collecting required background information to
determine the strategies, views and mission s of an
organization

Balance scorecard system is a tool for describing the
strategy. To achieve this hypothesis, it is necessary to
access the necessary data and information in the realm
of mission, perspectives, strategy, competitive condition
and the core capacities of the organization staff
(Bakhtiari, 2007).

Directing a course of interview for making clear the
perspective and mission statement and finally the
achievement of strategic goals

With respect to the studies and group sessions of the
university, perspectives, missions and goals are as
follows:

1) Creating a dynamic and creative learning environment
   for the teachers and researchers.
2) Providing permanent financial resources.
3) Preparing update software and hardware equipments.
4) Achieving, maintaining, and developing research
   situation for increasing scientific productions at national,
   regional, and international levels.
5) Improving and developing the quality of services for
   the students.
6) Continuous improvement of scientific and
   administrative management.

Integrating the results of interviews and determining
the strategic objectives and goals

After clarifying universities’ strategies and goals, any of
these goals should be assigned to four perspectives of
the balanced scorecard system. Balanced scorecard is
changed to a framework for implementing and strategic
managing at all levels of organization and it does this
work by linking to the ultimate goals, innovations and
standards related to the overall strategy and provides this
by maintaining financial measures with the other key
indicators around customer perspectives, internal
business processes, organizational growth, learning and
innovation and offers a view of organizational
performance to the company (Bakhtiari, 2007). So, the
goal has dedicated to four perspectives in Figure 2.

Assigned objectives to each four perspectives of the
balanced scorecard system

Balanced scorecard system completes financial
indicators from the past performance with the future
performance. The goals and indicators of balance
scorecard system have been determined through
strategy and perspectives of organization. This goals and
indicators refer to the performance of organization in four
aspects: Finance, customer, internal processes, learning
and growth (Figure 3). It also provides a framework for
balance assessment system. In fact, in this stage, the
strategy is converted to the goals (Kaplan and Norton,
2004).

Financial perspective

1) Financial perspective is vital for organizations,
because it will obligate us to identify and set financial
goals that an organization need to achieve them.
Financial perspective mentioned some cases which are
very important.
2) The main objective of business is to create wealth
creation that is determined by achieving the goals.
3) The purpose of the quantitative-financial goals is to
prepare the operational units for performance
management and to achieve the competencies for future
success.
4) Financial perspective is a related performance index
because it registers the success after its occurrence.

Therefore, we may explain the goals of an organization
as follows:

1) Reducing the cost of manpower.
2) The increased use of assets (Kaplan and Norton,
2004).
3) Developing the income opportunities (Kaplan and
Norton, 2004).
4) Improving the cost structure.
5) Growing the income from investments (Administration
proceedings, 2009).

Customer perspective

Who are our target customers and what we offer them
through evaluating the service? Customer’s perspective
goals and purposes describe the strategic goal and the
presentable value of an organization. Some of the goals
considered by the organizations are as the follows:

1) Effective and accountable operations.
2) Offering competitive prices.
3) Attracting, developing and retaining the best
   customers.
4) Increasing customer satisfaction.
5) Improving the perceived view of the university.
6) Delivering the innovations that make business and
career value.

Clients of educational organizations are employees,
students, parents, government and labor market
(Bakhtiari, 2007). In general, teachers of educational
organizations, managers, and learners are internal
Table 1. Worksheet of university’s selection to implement a balance scorecard system.

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Rating unit</th>
<th>Weight (%)</th>
<th>Total score</th>
<th>Justification reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existence of clear strategy</td>
<td>10</td>
<td>30</td>
<td>3</td>
<td>Universities generally have a clear strategy</td>
</tr>
<tr>
<td>Senior management support</td>
<td>10</td>
<td>30</td>
<td>3</td>
<td>With the establishment of a management meetings university issued a work order.</td>
</tr>
<tr>
<td>Need for balanced system</td>
<td>8</td>
<td>15</td>
<td>1.2</td>
<td>According to lake of suitable system for performing evaluation, It is felt the need to maintain and expand the unit and status in the future.</td>
</tr>
<tr>
<td>The key managers support</td>
<td>5</td>
<td>10</td>
<td>0.5</td>
<td>A little work might be done due to the business.</td>
</tr>
<tr>
<td>Corporate area</td>
<td>9</td>
<td>5</td>
<td>0.45</td>
<td>The activities of unit are determined clearly.</td>
</tr>
<tr>
<td>Possible to obtain information</td>
<td>9</td>
<td>5</td>
<td>0.45</td>
<td>It is possible to provide information easily according to the clear objectives, strategies and customer of the university</td>
</tr>
<tr>
<td>Resources</td>
<td>4</td>
<td>5</td>
<td>0.2</td>
<td>The department is facing shortage of manpower. So, it is in trouble for providing manpower for the project</td>
</tr>
</tbody>
</table>

clients, but governments, public sector, and parents are foreign clients. If both internal and external customers are satisfied with the performance of educational organizations, University will not lose their learners and will sustain a client perspective.

**Internal processes perspective**

In order to determine the strategic goals what should the internal processes perspectives of organization do?

One of the various benefits resulted from using the balanced scorecard, is identified as the results of actions in this perspective. Most performance systems in current processes are focused on gradual improvements, while the balanced scorecard method may lead to the formation of entirely new processes for realizing the desired values of the clients.

The internal processes may generally be classified in four groups:

1) Operational (a key goal in this strategy is a low end-cost): It produces the product and service and supply them, such as production, supply, providing the opportunities for students and preparing educational and research facilities.

2) Customer management (a key goal in customer-oriented strategy): It enhances the customer’s value, such as selecting students, employing, retaining and developing the instruction corresponding with them so that they are related to the ultimate quality assurance.

3) Innovation (a key goal of output leadership strategy): A process that will create new products and services such as: Identifying opportunity, research and development of projects, designing / developing and implementing.

4) Legal and social: Emphasis on effectiveness of the management, improvements in education quality, management process, real-time appraisal and services to increase effectiveness and reduce the time proposed to attract satisfaction (Neon, 2002).

**Learning and growth perspective**

Learning and growth perspective is the basic in the balanced scorecard system (Kaplan and Norton, 2004). This perspective may be regarded as a driving force for the three previous approaches in achieving high performance. The function of this perspective is to create a complete set of core technical capabilities and to improve the previous three perspectives. Upon rapid advances in information technology, competition in educational market has increased as widespread (Chen et al., 2006). Intangible assets in educational organizations, including universities, are classified in three groups:

1) Institutional capital
2) Investment information
3) Human capital

Some conceivable goals in this perspective are:

1) Developing the diverse and effective workforce
2) Promoting and developing the spirit of partnership
3) Appropriate access to information and an attractive and healthy working environment.

Universities should provide opportunities for members to learn and grow. Human capitals at the Universities are professors, researchers and staff.

Using the balanced scorecard in the performance evaluation system will result in improving the assessment, saving cost and time. The use of verbs such as increase or decrease, start, create, reduce, improve, becoming and the other verbs like these may be the facilitator when setting goals. Specified goals should create necessary motivation for performing the desired actions in people. But these goals should not necessary be quantitative in their nature.

Using indicator to achieve the success criteria for any goal

Performance measures form the basic core of the balanced scorecard. For selecting measures is to remain in combination of performance evaluation system which may be examined through some of these criteria. Collecting necessary data to calculate the measures is also one of the important aspects and challenges in the establishment of a balanced assessment system.

Some criteria for selecting performance measures

Designing and implementing the balanced scorecard as an organization management system orientation, requires the selection of goals, quantitative goals and executive initiatives to achieve them. Difficult decision making process appears at the stage of measures selection. These measures are as a main core in the balanced assessment system and it's considered as a reference and a focus point for all organizations.

Relationship with strategy

Relationship with strategy is considered as the most obvious and significant criterion to assess the measures but its importance is not necessary to be emphasized significantly. In many businesses, a balanced appraisal system includes number of measures play an important role in daily performance. But it does not seem to be directly associated to the strategy.
Being quantitative

Usually people involving in designing a balanced appraisal system, tend to evaluate subjective performance measures such as giving score to the functions of providers with titles such as "good" or "intermediate". The problem facing this way is that if 10 people give score to a provider, completely different results and responses may be found. Now, if the same providers are evaluated according to the percentage of deliveries performed on time, the obtained results will be objective and the same meaning carried to all those involved in the issue. All people have the same concept of 10% but the conception of "average" might be very different. With a little creativity, all of performance measures may be calculated mathematically. As shown in Table 2

Preparing an executive program for collecting the required data

Due to the quantity target refers to the units of university which associated with the target. For the three financial perspective and customer and internal processes will suffice to the working documents and reports from university.

STRUCTURE CONSTRUCTIONAL EQUATIONS, GROWTH AND LEARNING IN IRAN'S UNIVERSITY

The results of structural equations analysis is reflected in Figure 3. As seen, growth and learning are as dependent structures. As shown in Figure 3, empowerment has the most influence on the structure of growth and learning so that it has the highest correlation coefficient. Job satisfaction has the least influence on the structure of growth and learning.

Conclusion

Customer-oriented criteria are very important. In other words, this equation needs to be answered that what activities should be done by the university internally in order to meet the students' needs and expectations? One of the important obtained results about implementing the balanced scorecard system is the index classification. In other words, for any of four perspectives related to the
Table 2. Quantitative indicators.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Subject</th>
<th>Quantity targets</th>
<th>Disposal units</th>
<th>Performance indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial</td>
<td>Appropriate financial structure</td>
<td>Increasing income, increasing the rate of assets, reducing human resources costs</td>
<td>Tuition revenue, business gifts, rates of use of library facilities and resources, rate of human resources costs, redeemed or retired inappropriate employees</td>
<td>Accounting unit, promotions agency, educational unit, general unit, library, public relations</td>
</tr>
<tr>
<td>Customer</td>
<td>Accordance with customer expectations</td>
<td>Increasing customer satisfaction, image of university progressive</td>
<td>Customer satisfaction, the number of customer complaints, rate of dissatisfaction with the institution</td>
<td>Secretariat, educational unit, general unit, public relations</td>
</tr>
<tr>
<td>Internal process</td>
<td>Internal process</td>
<td>Implementation process with appropriate quality, appropriate training facilities, providing education with best quality</td>
<td>Rate of educational facilities up-to-date, rates of educational facilities, rates library, specialist teachers</td>
<td>Secretariat, public sector, educational unit, research division, information center</td>
</tr>
</tbody>
</table>

The balanced scorecard system (financial, customer, internal process, and growth and learning), firstly the quantitative goals need to be assigned accurately to allow a precise appraisal of reality with the available standards at any stage of implementation.

The fundamental principle in implementing the balanced scorecard system is that the criteria of performance evaluation be related to the university strategy.

In reaching to the important and essential conclusion in implementing the balanced scorecard system in the universities of Iran, this point should be stated that the perspective of growth and learning is an important and fundamental view in implementing the balanced scorecard system in the university. Selecting suitable quantitative goals and achieving these goals also allow implementing the other perspectives the important results are shown in Figure 3.

REFERENCES

Internal controls and access to commercial loan financing for small scale enterprises in Uganda

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The main financial challenge facing small and medium enterprises (SMEs) is access to affordable credit over a reasonable period. Despite the financial reforms aimed at improving SMEs, access to finance to improve their performance and growth, access to finance for SMEs remains a recurrent problem. This is even more pronounced for commercial loan financing and as long as banks apply the same lending principles to SMEs as to big firms, small businesses will be deprived of key access to finance. The structure and management of majority of SMEs is less developed with weak internal controls making the availability of information for risk analysis by the banks and micro-finance lenders inadequate. This research therefore led to an argument that the inherent weaknesses in the internal control structures of SMEs deny them access to commercial loan financing. SMEs in Uganda, suffer from constraints that lower their resilience to risk and prevent them from growing. Findings of the study indicated that the soundness of the various internal controls was a significant predictor for access to commercial loan financing. More specifically firms with sound asset control and an independent review stood a better chance of accessing funding. It was thus recommended that; SMEs work on setting up or improving their preventive and detective internal controls and risk management systems while ensuring that the installed systems are appropriate to their size and organizational complexity in order to improve their chances of accessing the much desired capital.

Key words: Soundness, internal, controls, access, loan, financing, small and medium enterprise (SME).

INTRODUCTION

Background to the study

The privatization drive and the civil and public service reforms that began in early 1990s laid a foundation for an increased number of small and medium scale enterprises (SMEs). By 2002, small-scale business enterprises were employing approximately 2,000,000 and serving about 6,000,000 people at business and household level. A challenge for many SMEs is access to finance; indeed most small businesses rely on accumulated earnings to provide the capital for investment and growth (Cobra, 2006). The availability of external finance for SMEs is a topic of significant research interest to academics and an issue of great importance to policy makers around the globe. The criteria used by commercial banks for lending to private sector are too tight and technically exclude borrowing by SMEs which find it difficult to meet the eligibility criteria (Tagoe et al., 2005). This research led to an argument that the inherent weaknesses of internal controls in SMEs deny them access to commercial loan financing. SMEs in Uganda, suffer from constraints that lower their resilience to risk and prevent them from growing. Findings of the study indicated that the soundness of the various internal controls was a significant predictor for access to commercial loan financing. More specifically firms with sound asset control and an independent review stood a better chance of accessing funding. It was thus recommended that; SMEs work on setting up or improving their preventive and detective internal controls and risk management systems while ensuring that the installed systems are appropriate to their size and organizational complexity in order to improve their chances of accessing the much desired capital.

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machinery and property) and intangible (for example, reputation or intellectual property). SMEs in Uganda, suffer from constraints that lower their resilience to risk and prevent them from growing and attaining economies of scale (Kasekende and Opondo, 2003). The objectives of the internal control structure of an entity are: to provide reliable financial statements and accounting records, safeguard the entity's assets, and promote operational efficiency and effectiveness, promote adherence to management’s policies and procedures (Robert and Charles, 2006).

In order for the bank to make a risk analysis and assess a business' application for a loan, there is need for a considerable amount of information. With appropriate internal controls in place, it is posited here that, strong internal controls would ensure that such information is readily available and the perceived risk of the business would be considerably low. The problem for SMEs is that they have small accounting departments and often they have no accounting department at all. The absence of a sound accounting system in SMEs usually results into poor business performance, insufficient information, and hence the most important reasons why SMEs do not succeed in acquiring credit from banks (European Communities, 2003). SMEs should therefore set up internal control and risk management systems, which are appropriate to their size and organizational complexity.

Problem statement and purpose of the study

The main financial challenge facing SMEs is access to affordable credit over a reasonable period (Tagoe et al., 2005). Despite the financial reforms aimed at improving SMEs’ access to financing this remains a recurrent problem (Stijn, 2006), this is even more pronounced for commercial loan financing and as long as banks apply the same lending principles to SMEs as to big firms, small businesses will be deprived of key access to finance (Cobra, 2006). Yet the structure and management of majority of SMEs is less developed with weak internal controls making the availability of information for risk analysis by the bank and micro lenders inadequate. The major purpose of the study therefore was to establish the relationship between the soundness of internal controls and access to commercial loan financing in SMEs of Uganda. The study was guided by several objectives including; determining the soundness of internal controls in SMEs, levels of access to commercial loan financing and the relationship between the soundness of internal controls and access to commercial loan financing.

Scope and justification of the study

This study looked at the internal controls comprising the internal control environment, risk assessment, information and communication, monitoring and control activities with particular emphasis on activities that comprise physical control of assets, segregation of duties, review, approval and authorization of activities, adequate documentation and Independent performance review. Commercial loan financing was mainly viewed from the point of view of the commercial banks and microfinance institutions, with questions relating to access variables including availability, affordability, processing speed ability to meet lenders’ collateral requirements and perceived flexibility of borrowing conditions. variables shown in Figure 1. A study of this nature was significant in a way that the results allowed a reappraisal of the competing theories of access to finance for SMEs and other businesses in general by bring out a widely ignored demand side determinant of access to finance, that is, the soundness of internal controls. This issue is one of the most important topics, not only in Uganda, but globally, as testified by the number papers, books and international conferences on this subject that have taken place over time. It is therefore, hoped that the debate henceforth will generate a great deal of interest, not only among business practitioners, academic researchers, students and consultants, but also among the general public.

LITERATURE REVIEW

The researchers here present extant literature on the key variables under study. This review provided a deeper understanding of the soundness of internal control activities as well as access issues to formal external financing and this provided a basis for the conceptual framework as well as an informed analysis of the findings.

Soundness of internal controls

Internal control is broadly defined as a process by an entity's board of directors, management, and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in terms of effectiveness and efficiency of operations, reliability of financial reporting and compliance with laws and regulations. Committee of Sponsoring Organizations (COSO) defines internal control as having five components. The COSO definition relates to the effectiveness and efficiency of operations, reliability of financial reporting and compliance with laws and regulations. Committee of Sponsoring Organizations (COSO) defines internal control as having five components. The COSO definition relates to the aggregate control system of the organization, which is composed of many individual control procedures. Discrete control procedures or controls are defined by the Securities Exchange Commission (SEC) as: "...a specific set of policies, procedures, and activities designed to meet an objective. A control may exist within a designated function or activity in a process. A control's impact may be entity-wide or specific to an account balance, class of transactions or application."
Controls have unique characteristics – for example, they can be: automated or manual; reconciliations; segregation of duties; review and approval, authorizations; safeguarding and accountability of assets; preventing or detecting error or fraud. Controls within a process may consist of financial reporting controls and operational controls (that is, those designed to achieve operational objectives). The self-assessment of internal control, commonly referred to as the internal control questionnaire (ICQ) is a tool utilized to assist in confirming the presence of a sound system of internal controls. Such a system includes fully documented policies and procedures which accomplish among other items the following: transactions that are executed according to management's general or specific authorization, transactions that are recorded as required for the preparation of financial statements which comply with generally accepted accounting principles, access to assets is permitted only according to management's authorization, the asset records are compared with the existing assets action is taken to reconcile any differences. The ultimate responsibility for strong system of internal control rests with management. On an annual basis, when submitting financial statement information, management must attest to the accuracy of that information along with the soundness of internal controls. Strong internal control structure can help your company, make better business decisions with higher quality, timelier information, gain (or regain) investor trust, prevent loss of resources, comply with applicable laws and regulations, and gain competitive advantage through streamlined operations (SICF, 1992).

Control environment

The control environment sets the tone of an organization, influencing the control consciousness of its people. It is the foundation for all other components of internal control, providing discipline and structure. It means the overall attitude, awareness and actions of directors and management (that is, "those charged with governance") regarding the internal control system and its importance to the entity. They express it in management style, corporate culture, values, philosophy and operating style, the organizational structure, and human resources policies and procedures. Control environment is the foundation of an effective internal control system and begins with the "tone at the top" - the words and actions of the agency’s leadership. Under an effective control environment, employees view internal control as essential and integral to doing their day-to-day job duties.

Risk assessment

An entity’s risk assessment for financial reporting purposes is its identification, analysis and management of risks relevant to the preparation of financial statements that are fairly presented in conformity with generally accepted accounting principles. To many people, risk assessments (the second component of the COSO framework) are a mystery. This is not because they do not understand risk - everyone has to think about and assess risk every day - but because these everyday risk assessments are rarely written down or formalized. More generally, risk assessments help management identify control gaps and redundancies so that action plans can be formulated to plug control gaps, strengthen existing controls, or remove redundancies where applicable. To this end, the COSO framework provides a guide for documenting risk assessments. Other reasons for preparing risk assessments include providing management with knowledge of control activities in place, and using the resulting risk assessment documentation, especially process narratives, flowcharts, and risk grids, as a repository for information where there is staff turnover.

The COSO framework defines risk assessment as "...the identification and analysis of relevant risks to achievement of the [entity’s] objectives, forming a basis for the determination of how the risks should be managed." This means: determining what needs to be done (objectives/goals), identifying what can go wrong (risks), prioritizing what can go wrong (risk ranking), and formulating actions that will reduce the chance of things going wrong (control activities).

Information and communication

The information system relevant to financial reporting objectives, which includes the accounting system, consists of the methods and records established to record, process, summarize, and report entity transactions (as well as events and conditions) and to maintain accountability for the related assets, liabilities, and equity. Communication involves providing an understanding of individual roles and responsibilities pertaining to internal control over financial reporting. Pertinent information must be identified, captured and communicated in a form and timeframe that enable people to carry out their responsibilities. Information systems produce reports, containing operational, financial and compliance-related information, that make it possible to run and control the business. They deal not only with internally generated data, but also information about external events, activities and conditions necessary to informed business decision-making and external reporting. Effective communication also must occur in a broader sense, flowing down, across and up the organization. All personnel must receive a clear message from top management that control responsibilities must be taken seriously. They must understand their own role.
in the internal control system, as well as how individual activities relate to the work of others. They must have a means of communicating significant information upstream. There also needs to be effective communication with external parties, such as customers, suppliers, regulators and shareholders. (COSO, 2011)

**Control activities**

Control activities consist of the specific policies and procedures that are put in place to mitigate the risk of error, noncompliance, and fraud. Control activities occur throughout the organization, at all levels and in all functions. There are several categories of control activities: physical control of assets, segregation of duties, authorization of activities, adequate documentation, independent performance review, verifications and reconciliations, (Hayes and Schilder, 1999). Companies that neglect to institute the required controls may find themselves in situations similar to those that led to the promulgation of Sarbanes-Oxley act in the first place, resulting in: increased exposure to fraud, sanctions from the SEC, unfavorable publicity (SOX, 2003). Firms who care for the value of their franchise and long run profits have strong incentives to build sound internal control activities to reduce risks and fraud (Dermin, 2000). The internal organizational structure and the environment in which it operates are continuously evolving, so the risks it faces are always changing. A sound internal control system therefore depends on a regular evaluation of risks to which the organization is exposed. The purpose of internal control is to help manage and control risk rather than to eliminate it. Even though it is not possible to provide complete assurance, the internal control system could be designed and applied to manage the nature and extent of risk to acceptable levels (for example, relating the cost of control to the significance of risk). Since risk assessment is the key for a sound system of internal control and governance, getting it right from the start is important (Financial Guidelines Series, 2001). The following activities are important.

**Physical control of assets:** An agency must establish physical control to secure and safeguard vulnerable assets. Examples include security for and limited access to assets such as cash, securities, inventories, and equipment which might be vulnerable to risk of loss or unauthorized use. Such assets should be periodically counted and compared to control records, investigate and correct differences. Liquid assets, assets with alternative uses, dangerous assets, vital documents, critical systems, and confidential information must be safeguarded against unauthorized acquisition, use, or disposition. Examples of access controls to assets are as follows: locked door, keypad systems, card key system, badge system, biometric system, locked filing cabinet, guard, terminal lock, computer password, menu protection, automatic call-back for remote access, smart card, and data encryption. (United States General Accounting Office, 1999) Inadequate internal control over assets may increase the susceptibility of misappropriation of assets. For example, misappropriation of assets may occur because of the following: inadequate segregation of duties or independent checks, inadequate over sight of senior management expenditures, such as travel and other re-imbursements, inadequate record keeping with respect to assets, inadequate system of authorization and approval of transactions, inadequate physical safeguards over cash, banks accounts, investments, inventory, or fixed assets, disregard for internal control over misappropriation of assets by overriding existing control procedures by failing to correct known internal deficiencies (Integrated Framework, 1992).

**Independent performance review:** Activities need to be established to monitor performance measures and indicators. These controls could call for comparisons and assessments relating different sets of data to one another so that analyses of the relationships can be made and appropriate actions taken. Controls should also be aimed at validating the propriety and integrity of both organizational and individual performance measures and indicators. Reviewing reports, statements, reconciliations, and other information by management is an important control activity; management should review such information for consistency and reasonableness. Reviews of performance provide a basis for detecting problems. Management should compare information about current performance to budgets, forecasts, prior periods, competitors, or other benchmarks to measure the extent to which goals and objectives are being achieved and to identify unexpected results or unusual conditions which require follow-up. Broadly defined, reconciliation is a comparison of different sets of data to one another, identifying and investigating differences, and taking corrective action, when necessary, to resolve differences (Integrated Framework, 1992).

**Segregation of duties:** This involves allocating work to different persons in such a way that either the work of one is complementary to the work of another person or another person independently checks the accuracy or correctness of work performed by one person as it helps employees know what to do and what others are to do (Saleemi, 1991) this is done to minimize errors and fraud and detect them in a timely manner when they take place. Key duties and responsibilities need to be divided or segregated among different people to reduce the risk of error or fraud. This should include separating the responsibilities for authorizing transactions, processing and recording them, reviewing the transactions, and handling any related assets. No one individual should control all key aspects of a transaction or event (ISA 315, 2004).
**Authorizations of activities:** Access to resources and records should be limited to authorized individuals, and accountability for their custody and use should be assigned and maintained. Periodic comparison of resources with the recorded accountability should be made to help reduce the risk of errors, fraud, misuse, or unauthorized alteration. Transactions and other significant events should be authorized and executed only by persons acting within the scope of their authority. This is the principal means of assuring that only valid transactions to exchange, transfer, use, or commit resources and other events are initiated or entered into (Internal Control, 1999).

**Adequate documentation:** Appropriate documentation of transactions and all transactions and other significant events need to be clearly done, and the documentation should be readily available for examination. The documentation should appear in management directives, administrative policies, or operating manuals and may be in paper or electronic form. All documentation and records should be properly managed and maintained (Internal Control, 1999). Transactions should be promptly recorded to maintain their relevance and value to management in controlling operations and making decisions. This applies to the entire process or life cycle of a transaction or event from the initiation and authorization through its final classification in summary records. In addition, control activities help to ensure that all transactions are completely and accurately recorded (FEE, 2004).

**Monitoring**

Monitoring is a process that assesses the quality of internal control performance over time. This is accomplished through ongoing monitoring activities, separate evaluations or a combination of the two. Ongoing monitoring occurs in the course of operations. It includes regular management and supervisory activities, and other actions personnel take in performing their duties. The scope and frequency of separate evaluations will depend primarily on an assessment of risks and the effectiveness of ongoing monitoring procedures. Internal control deficiencies should be reported upstream, with serious matters reported to top management and the board (COSO, 2011).

**Internal controls and access to bank loan financing**

Access is not easy to measure because it has many dimensions. Affordability, accessibility and timeliness of short-term and export credit are seen as major constraints. Of these, timeliness is a significantly more important factor than even the cost of financing, a fact that is not always adequately appreciated by bankers and other development finance institutions (Hibbert, 2000). Accessibility (rigid lending conditions collaterals), affordability (costs of processing loans interests), timeliness (delays in approving requests), adequacy (may not approve entire request), lack of diversity of financial products, internal weaknesses within the firms, poor credit reputation (borrowers do not pay) are the main constraints faced by SMEs (Mvingira and Rutageruka, 2005). This lack of access to financial services is reinforced by the geographical location of bank branches and rationalization in banking infrastructure, largely as a result of economic factors. Services need to be available when desired, and products need to be tailored to specific needs; the prices for these services need to be affordable, including all non-price transactions costs such as information processing costs or physical distance; and credit resources should not be limited to borrowers with connections, collateral or track record rather than projects with highest expected returns. Policy research report (PRR) on access to finance, 2006. SMEs draw financing from a variety of sources. Most SMEs rely on internal savings, retained earnings and borrowing from family, friends and money lenders (collectively known as ‘informal sector’) as opposed to the few which have access to formal sector finance (banks, capital markets, venture capitalists etc) It is important that SMEs compile financial statements to gain access to project finance. SMEs in early transition countries rarely prepare formal financial statements on a reliable basis. Lending money short term to finance working capital may not require formal financial statements in the case of micro enterprises. However, lending money long term to finance capital projects does require formal financial reporting for sound banking. Such statements signal that the owners of the enterprise acknowledge the claims of suppliers, lenders and owners according to their rank. They disclose the size of those claims in relationship to the size of the firm, and state whether or not the firm is solvent. A supplier of capital, faced with a refusal to supply financial statements, should not be confident that the enterprise has the intention of honoring its claims in the long run.

SME loans are higher risk, particularly unsecured or under secured, but present a competitive edge and tremendous growth opportunities for lenders using an advanced lending methodology (Leete, 2006). For the company requesting the credit: the external cost (cost of credit is high, because the perceived risk is particularly high for SME’s) as well as internal cost (administrative cost to get a credit is high too (Jerome, 2001). Credit cost is worse for SME’s in emerging markets. There is very limited transparency: all SME’s hate to give figures, but the secrecy is even worse in most emerging countries.

Attitude of authority vis-à-vis information on companies is frequently ambivalent: they do not really encourage transparency. So credit management on trade credit extended to SME’s in emerging countries is complex:
both credit underwriting and credit monitoring (money for the lender is frequently made – or lost – in credit management after extending the credit). Hence, it is no surprise if there is very limited trade credit available for SME’s in emerging countries and few institutions in emerging countries are ready to lend to SME’s. And there is very little trade credit extended by suppliers to emerging countries SME’s (Kasekende, 2001).

SME’s in Uganda have the most difficulty in accessing finance because of the inherent risks perceived by banks which make their costs of finance quite expensive (Griffiths, 2002). The micro business segment (SMEs) is historically the hardest commercial sector to find reliable and usable data upon which to base sound lending decisions. However, it potentially represents one of the most profitable lending segments in any emerging credit market. Unfortunately it is often difficult for banks to understand how SMEs work because of information asymmetries on both sides, and a lack of transparency. The most common equity financing used by SMEs is retained earnings; 51% of SMEs utilize this financial instrument. Only established companies with a strong history of persistent profitability will be able to access this form of financing (Heidrick and Nicol, 2002). One of the major problems that banks are faced with internally in lending to SMEs in Uganda is the poor standards of accounting and financial disclosure in transitional economies which made banks reluctant to rely on SME borrowers’ financial statements and insist instead on adequate collateral. Yet this is a problem that could be addressed by a sound internal control structure. Such a problem leads to lenders questioning the SMEs’ viability in the banks’ judgment, which makes SME lending a higher credit risk (Kasekende, 2001). A sound system of internal controls contributes to safeguarding the shareholders’ investment and the institution’s assets. They help ensure that the company is not unnecessarily exposed to avoidable financial risks and that financial information used within the business and for publication is reliable. They also contribute to the safeguarding of assets which would intern be used as collateral for borrowing purposes. In developing countries, commercial banks mainly have provided loans to (SMEs). Most of these loans are given to enterprises that have a relatively solid bottom line and sufficient financial data. SMEs are particularly vulnerable to a lack of credit availability, because they are so often informationally opaque (Berger, 1999; Berger and Udel, 2001). In contrast, larger enterprises with better business plans, more reliable financial information have easier time to obtain finance through traditional means.

METHODOLOGY

The researchers here present a description of the methodology that was employed in carrying out the study. It spells out the research design, the study population and area, the sampling methods, size and procedure, data collection, processing and analysis procedures and techniques. A cross-sectional, exploratory research design was employed and owner managers of selected SMEs were targeted for response on internal control activities and access to commercial loan financing of SMEs. The survey targeted 198 manufacturing SMEs located in Kampala district derived from the SMEs registered by the USSIA, 2004. A random sample of 131 SMEs was selected and the researchers used a structured questionnaire on a 5-point Likert scale ranging from, 1 = strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, to 5 = strongly agree. A pre-tested comprehensive structured questionnaire was used to collect relevant and reliable primary data that was then edited; coded and analyzed using scientific and computerized analysis packages such as SPSS and methods such as correlation and regression analysis were employed. To ensure reliability and validity of the instruments and to build confidence that the instrument would yield good results, the research instrument was tested for reliability and quality using the content validity index (CVI) and Crombach’s alpha coefficient which were all above 0.6 which implied that the instrument was highly valid and reliable.

PRESENTATION AND DISCUSSION OF FINDINGS

This chapter presents the analysis, interpretation and discussion of findings of the study based on the primary data analysis conducted by the researchers. It presents the findings on the soundness of internal controls activities and access to commercial loan financing for SMEs in Uganda.

Response rate and descriptive statistics

A high response rate (Table 1) was registered providing more confidence in the results of the study. An overall response rate of 95% was achieved with respondents in the foods and beverages sector showing 100% response rate followed closely by handcrafts and ceramics at 97%, then foods and beverages, 96%, textiles and leather, 95% and lastly services and others at 92%.

Findings in Table 2 showed a relatively balanced representation of the male and female respondents at approximately 58 and 42% for males and females respectively. A further analysis of the sector representation in business participation revealed more women than men in textiles and leather, more men than women in foods and beverages, more men than women in metal and wood curving and the other entire business sector. This showed a male dominance in business involvement.

Soundness of internal controls in small and medium enterprises (SMEs)

Findings in Table 3 revealed significant differences in the application of the various internal control components. Practices relating to internal control activities were more prevalent (t = 88.63, p<0.01) than any other components of internal controls, followed by the internal control environment (t = 78.04, P<0.01), then monitoring (t =...
Table 1. Showing category of respondents and response rate.

<table>
<thead>
<tr>
<th>Category respondents per sector</th>
<th>Sample size (n_i)</th>
<th>Returned</th>
<th>% Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textiles and leather</td>
<td>22</td>
<td>21</td>
<td>95</td>
</tr>
<tr>
<td>Foods and beverages</td>
<td>24</td>
<td>23</td>
<td>96</td>
</tr>
<tr>
<td>Metal and wood curving</td>
<td>21</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td>Handcrafts and ceramics</td>
<td>29</td>
<td>28</td>
<td>97</td>
</tr>
<tr>
<td>Services and others</td>
<td>36</td>
<td>33</td>
<td>92</td>
</tr>
<tr>
<td>Total</td>
<td>132</td>
<td>126</td>
<td>95</td>
</tr>
</tbody>
</table>

Source: Primary data.

Table 2. Gender and business sector cross tabulation.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Textiles and leather</th>
<th>Food and beverages</th>
<th>Metal and wood curving</th>
<th>Handcrafts and ceramics</th>
<th>Services and others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>7</td>
<td>15</td>
<td>12</td>
<td>17</td>
<td>20</td>
<td>71</td>
</tr>
<tr>
<td>Female</td>
<td>13</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>13</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>22</td>
<td>20</td>
<td>27</td>
<td>33</td>
<td>122</td>
</tr>
</tbody>
</table>

Source: Primary data.

Table 3. Relative importance of internal control components.

<table>
<thead>
<tr>
<th>Test value = 0</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal control environment</td>
<td>78.037</td>
<td>125</td>
<td>0.000</td>
<td>4.06631</td>
</tr>
<tr>
<td>Risk assessment</td>
<td>39.888</td>
<td>125</td>
<td>0.000</td>
<td>3.03292</td>
</tr>
<tr>
<td>Information and communication</td>
<td>47.773</td>
<td>125</td>
<td>0.000</td>
<td>4.03912</td>
</tr>
<tr>
<td>Internal control activities</td>
<td>88.634</td>
<td>125</td>
<td>0.000</td>
<td>4.08974</td>
</tr>
<tr>
<td>Monitoring</td>
<td>57.767</td>
<td>125</td>
<td>0.000</td>
<td>3.72024</td>
</tr>
</tbody>
</table>

Source: Primary data.

57.76, p<0.01), then information and communication (t = 47.77, p<0.01) and lastly risk assessment (t = 39.88, p<0.01). The result indicated that management of SMEs is less conscious of risk assessment or rather there may be fewer risks in SMEs as compared to larger more complex organizations. Fewer risks though should not be taken for granted, and therefore, business management should be made aware of the benefits of risk assessment and management techniques. With findings indicating that internal control activities are the most prevalent and important in SMEs, a further breakdown is hereby presented.

Findings in Table 4 revealed significant differences in perceptions on the existence of internal control activities among the various SME sectors. Using a t-test, it was revealed that the highest mean difference was recorded on the physical control of business assets (t = 98.037, p < 0.01), implying that more emphasis was put on securing the safety of assets such as cash, inventory and other physical assets of the businesses. Documentation appeared to be the next in importance (t = 77.734, p < 0.01) with the main documents kept including receipts and invoices, although some businesses did not put emphasis to their importance in their conduct of business. Independent performance review followed at (t = 67.767, p<0.01) with significant mean difference in perception on the existence of an independent performance review mechanism followed by authorization and approval (t = 59.988, p<0.01) and lastly segregation of duties (t = 37.273) as the least important or rather least existent internal control activity. This is not surprising as most of the SMEs were either managed by their owners or family members, creating little room for authorization and segregation of duties. Although the findings here are in agreement with common practice among SMEs, it is in contravention with the requirements in ISA 315, 2004 that requires no one individual to control all key aspects of a transaction or event.
Table 4. Relative importance of internal control activities.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test value = 0</th>
<th>99% Confidence interval of the difference</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t</td>
<td>df</td>
<td>Sig. (2-tailed)</td>
<td>Mean difference</td>
</tr>
<tr>
<td>Physical control of business assets</td>
<td>98.037</td>
<td>125</td>
<td>0.000</td>
<td>4.09974</td>
</tr>
<tr>
<td>Authorization and approval</td>
<td>59.988</td>
<td>125</td>
<td>0.000</td>
<td>4.03912</td>
</tr>
<tr>
<td>Segregation of duties</td>
<td>37.273</td>
<td>125</td>
<td>0.000</td>
<td>3.62976</td>
</tr>
<tr>
<td>Adequate documentation</td>
<td>77.734</td>
<td>125</td>
<td>0.000</td>
<td>4.00231</td>
</tr>
<tr>
<td>Independent performance review</td>
<td>67.767</td>
<td>125</td>
<td>0.000</td>
<td>3.72024</td>
</tr>
</tbody>
</table>

Source: Primary data.

Table 5. Access to commercial loan financing.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test value = 0</th>
<th>99% Confidence interval of the difference</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t</td>
<td>Df</td>
<td>Sig. (2-tailed)</td>
<td>Mean difference</td>
</tr>
<tr>
<td>Access to bank loan financing</td>
<td>64.657</td>
<td>125</td>
<td>0.000</td>
<td>3.11496</td>
</tr>
<tr>
<td>Access to micro-financing</td>
<td>57.299</td>
<td>124</td>
<td>0.000</td>
<td>2.90585</td>
</tr>
</tbody>
</table>

Source: Primary data.

Internal controls and Access to commercial loan financing

Findings in Table 5 showed significant mean differences on access to commercial loan financing. These were limited to bank loan financing and micro financing for purposes of this research. A look at the findings indicates that bank loan financing provides a more significant source of financing to the industrial SMEs (t = 64.657, p<0.01) although, micro financing also provided an important source as well. For purposes of this study, access from the above sources was measured using access variables presented earlier in the conceptual framework and widely covered in extant literature. In line with this literature, timeliness was found to be a significantly more important factor than even the cost of financing/affordability, collateral requirement and many others. Slow loan processing speeds could be as result of inadequate information from the SMEs relating to their creditworthiness. Such internal control weaknesses have been largely ignored by the majority of firms. Internal control weaknesses within the firms, lead to poor credit reputation, a major obstacle faced by SMEs as identified by (Mvingira and Rutageruka, 2005).

Findings in Table 6 revealed significant correlations between most of the internal control components and access to both bank and micro finance loan financing. The internal control environment positively correlated with access to bank loan financing (r = 0.452, p<0.01) although, it had no significant relationship with access to micro financing. This finding provides an important insight on the discrepancy in considerations between banking and micro finance institutions in providing access to loans to SMEs in Uganda. Whereas banks would require a sound control environment, evidence here showed that micro finance institutions are less concerned. Therefore, unlike majority of micro finance institutions, SMEs that seek funding from banks must focus on improving their internal control environment to set the tone for an effective internal control system in their management style, corporate culture, values, philosophy and operating style, the organizational structure, and human resources policies and procedures. This is because the control environment is the foundation of an effective internal control system. It was observed further, that risk assessment was neither significantly related to access to bank loan financing nor micro-financing. This implies that the operating structure of most the SMEs under study either lacked a risk assessment system or rather the levels of risk assessment in such organizations had no significant relationship with their levels of access to bank loan financing. It did not however come out clearly as to whether or not the concept of risk assessment is relevant to the Ugandan SMEs. Whereas information and communication strongly correlated with access to bank loan financing (r = 0.440, p < 0.01), the results revealed no significant correlation with micro financing. Although, firms that access bank loan financing seem to understand
Table 6. Soundness of internal controls and access commercial loan financing.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Internal control environment</th>
<th>Risk assessment</th>
<th>Information and communication</th>
<th>Internal control activities</th>
<th>Monitoring</th>
<th>Access to bank loan financing</th>
<th>Access to micro-financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal control environment</td>
<td>Pearson Corr. 1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk assessment</td>
<td>Pearson Corr. 0.784**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information and communication</td>
<td>Pearson Corr. 0.782**</td>
<td>0.798**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal control activities</td>
<td>Pearson Corr. 0.745**</td>
<td>0.721**</td>
<td>0.774**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td>Pearson Corr. 0.782**</td>
<td>0.679**</td>
<td>0.698**</td>
<td>0.688**</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to bank loan financing</td>
<td>Pearson Corr. 0.452**</td>
<td>0.150</td>
<td>0.440**</td>
<td>0.464**</td>
<td>0.00135</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Access to micro-financing</td>
<td>Pearson Corr. 0.185*</td>
<td>0.172**</td>
<td>0.139</td>
<td>0.259**</td>
<td>0.0067</td>
<td>0.502**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Source: Primary data.

the fact that information systems help produce reports, containing operational, financial and compliance-related information, which make it possible to run and control the business which in turn makes them credit worthy, this was not the case for those that mainly make use of micro financing. Whereas there was no significant relationship between monitoring as an internal control activity with both sources of commercial loan financing, it is noteworthy that internal control activities positively and significantly correlated with access to bank loan financing \( r = 0.464, p < 0.01 \) as well as micro financing \( r = 0.259, P < 0.01 \). This came out as the only internal control component that positively and strongly correlated with both sources of commercial loan financing thereby revealing its level of importance as far as access is concerned. This therefore led to the need to make an in-depth analysis of the relationship between the various internal control activities and access to commercial loan financing. These components for purposes of this study included segregation of duties, physical control of business assets, authorization and approval, and adequate documentation. It is posited here that firms which neglect to institute the required controls may find themselves in situations that result in increased exposure to fraud, regulatory authorities as well as unfavorable publicity that puts them in an unfavorable position for accessing funding.

In Table 7, findings on the existing relationship between the various internal control activities and
Table 7. Soundness of internal control activities and access.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Segregation of duties</th>
<th>Physical control of business assets</th>
<th>Authorization and approval</th>
<th>Adequate documentation</th>
<th>Independent performance review</th>
<th>Soundness of internal control activities</th>
<th>Access to bank loan financing</th>
<th>Access to micro-financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segregation of duties</td>
<td>Pearson Corr.</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical control of business assets</td>
<td>Pearson Corr.</td>
<td>-0.104</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.445</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authorization and approval</td>
<td>Pearson Corr.</td>
<td>-0.476**</td>
<td>0.577**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.002</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate documentation</td>
<td>Pearson Corr.</td>
<td>-0.002</td>
<td>0.439**</td>
<td>0.534**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.980</td>
<td>0.007</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent performance review</td>
<td>Pearson Corr.</td>
<td>-0.271**</td>
<td>0.372**</td>
<td>0.591**</td>
<td>0.486**</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.002</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soundness of internal control activities</td>
<td>Pearson Corr.</td>
<td>0.345**</td>
<td>0.521**</td>
<td>0.674**</td>
<td>0.719**</td>
<td>0.631**</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to bank loan financing</td>
<td>Pearson Corr.</td>
<td>0.152</td>
<td>0.150</td>
<td>0.140</td>
<td>0.045</td>
<td>0.431**</td>
<td>0.46**</td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.090</td>
<td>0.093</td>
<td>0.118</td>
<td>0.616</td>
<td>0.009</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Access to micro-financing</td>
<td>Pearson Corr.</td>
<td>-0.185*</td>
<td>0.272**</td>
<td>0.239**</td>
<td>0.053</td>
<td>0.477**</td>
<td>0.159</td>
<td>0.502**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.039</td>
<td>0.002</td>
<td>0.007</td>
<td>0.555</td>
<td>0.002</td>
<td>0.076</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Source: Primary data.

The ability to access commercial loan financing are presented. It was noted that there was no significant relationship between segregation of duties and access to any form of financing understudy. This was probably as a result of the apparent structure of most of the SMEs that are either owner or family managed where controls such as segregation of duties are not deemed necessary. There was however a significant positive relationship between the physical control of assets such as cash and inventory and access to commercial loan financing ($r = 0.445, p < 0.01$) implying that the better the management of assets in the business, the higher the chances of access. Authorization, approval and documentation as internal control activities had no significant relationship with access, implying that the majority of the firms under study did not have to keep
necessary financial documents to boost their chances of accessing finance. While independent performance review had a significant positive relationship with access to formal financing \((r = 0.493, p < 0.01)\). This implies that the firms which tend to subject their performance to an independent review stood a better chance of accessing formal external financing.

In general, the relationship between the soundness of internal controls showed a positive relationship with access to commercial loan financing \((r = 0.443, p < 0.01)\). This implies that firms need to be encouraged to improve the soundness of their internal controls if their chances of access to finance are to be boosted. A regression analysis in Table 8 using the adjusted \(r^2\) revealed that about 19.6\% of the variations in access to finance can be explained with 99% confidence by the soundness of internal controls among SMEs. This was in agreement with literature where it was stated that most of the loans are given to enterprises that have a relatively solid bottom line and sufficient financial data that can only be available with a well build internal control system.

**Conclusions**

Significant differences in the application of the various internal control components were revealed among Ugandan SMEs with internal control activities more prevalent than any other components of internal controls, followed by the recommended practices in the internal control environment then information and communication and lastly risk assessment. This implied that, whereas there was evidence of application of some internal controls; some components such as information and communication, risk assessment and monitoring are not given substantial attention as would be recommended by best practice. There was a general notion that small and medium scale businesses are faced with minimal risks of
fraud and error mainly because majority of the SMEs were owner or family managed, although fewer risks should not be taken for granted. This also was reflected in insignificant relationship that existed between risk assessment and monitoring with the levels of access to commercial loan financing. As a result, we call for creation of awareness of the benefits of risk assessment and management techniques as well as the value of a sound internal control system. Internal control activities were the most consciously implemented internal controls and a further analysis of the soundness of specific activities revealed physical control of business assets as the best priority area with a lot of emphasis put on safety of assets such as cash and inventory. A great deal of documentation of the transaction processes was next in importance covering documents such as vouchers, receipts and invoices. Independent performance review, segregation of duties, authorization and approval of transactions were among the financial controls that were less prevalent and this could also be attributed to the ownership and management structure of the firms understudy. Independent performance review that includes external and internal audit is usually more prevalent in large and or listed companies where this is a regulatory requirement for corporate governance. We believe that if such good practices are translated to the SMEs their visibility in terms of financial stability for purposes of bank and micro lending would be enhanced.

The study revealed that bank loan financing provides a more significant source of financing to SMEs than micro financing. There were significant positive correlations between most of the internal control components and access to mainly bank loan financing, and in fewer circumstances micro financing. The significant positive relationship between the internal control environment and access to bank loan financing yet insignificant with micro loan financing revealed interesting discrepancies in considerations between banking and micro finance institutions in providing access to loans to SMEs in Uganda. Whereas banks would require a sound control environment, evidence here showed that micro finance institutions are less concerned. Risk assessment was neither significantly related to access to bank loan financing nor micro-financing. This implies that the operating structure of most the SMEs under study either lacked a risk assessment system or rather the levels of risk assessment in such organizations had no significant relationship with their levels of access to bank loan financing. Whereas information and communication systems strongly correlated with access to bank loan financing, the results revealed no significant correlation with micro financing. Firms that seek to access bank loan financing should build information systems that help produce reports, containing operational, financial and compliance-related information. Only internal control activities positively and significantly correlated with access to both bank loan and micro loan financing, presenting as the only internal control component that positively and strongly correlates with both sources of commercial loan financing. Findings further revealed that firms with sound asset control and an independent review stood a better chance of accessing formal bank loan financing. An overall view of the relationship showed a significant positive relationship between internal controls and access to commercial loan financing and this implied that firms need to be encouraged to improve the soundness of their internal controls if their chances of accessing commercial loans are to be boosted, as loans are given to enterprises that have relatively sufficient financial data that is usually a result of a well maintained internal control system with comprehensive preventive and operational controls that manifest themselves as either financial or physical control in nature. Conscious steps must therefore be taken to ensure that such controls are effective and consistent with the structural characteristics of the firm in question.

RECOMMENDATIONS

The aforementioned findings indicated that firms without sound internal controls have insufficient information to help finance providers make an objective assessment of the business capacity to pay back, and that such businesses are characterized by high risk and increased cost of capital, being reasons why SMEs do not succeed in acquiring credit from banks and micro finance institutions. It is recommended here under that:

1. SMEs work on setting up or improving their internal control and risk management systems while ensuring that such controls conform to the requirements of the international standards on auditing (ISA).
2. The installed systems should be appropriate to their structure size and organizational complexity.
3. More sensitization on the need for internal controls should done in Uganda among the owner managers of SMEs to make them better rated for financing.
4. SMEs that seek funding from banks must focus on improving their internal control environment to set the tone for an effective internal control system in their management style.
5. Business skills training and education materials should provide knowledge on the need for internal controls in all areas of business operations.

Recommended areas for further research

Considering that the findings in this study indicated that only 19.6% of the variations in access to commercial loan financing are explained by levels of soundness of internal controls, it is recommended that this study is replicated in larger scale businesses, as well as study access of
finance from the supply side perspective.

REFERENCES

The effects of labor wage tax reform on the Iran economy: A computable general equilibrium model approach

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Government revenue in Iran is highly dependent on the oil sales. Iranian government in order to decrease dependence on oil sales should obtain new income resources by expanding the tax base. Labor wage tax is not considered an important source of government revenue. Thus increasing tax rate on labor wage is necessary for government revenue. This paper attempts to develop and use computable general equilibrium model to examine the economic impacts of increasing labor wage tax in industrial and mining sector on the Iran economy. It contacted three simulations to examine the consequences of possible changes that occur in Iran economy due the increase in labor wage taxes. The policy issues addressed in this paper are 5, 10 and 15% increase in labor wage tax in industry and mining sectors. The increase of the labor wage tax rate may cause Iran's gross domestic product (GDP) and household income to decline from the benchmark level while the government revenue would increase. Also the sectoral effects are discussed in this paper.

Key words: Labor wage tax, computable general equilibrium, Social Accounting Matrix.

INTRODUCTION

Resource allocation, income distribution, economic growth and economic stability are all responsibilities of governments. To fund these duties, government must draw a variety of revenue sources. In many developed countries most of the government’s revenue comes from taxes. In contrast, government revenue in Iran is highly dependent on the production and export of crude oil, and is consequently vulnerable to fluctuations in international oil prices. The Iranian government cannot indefinitely use oil revenues to reform the economic structure. Iran’s economic experience in recent decades has shown that continuation of using oil revenue to make an increase in liquidity will cause inflation in the national economy. Following the guidelines of the Third Socio-economic and Cultural Development Plan to decrease dependence on oil sales, taxes are being increased to make up a larger portion of the Iranian government’s revenues. The Fifth Development Plan of Iran anticipates that the government budget will be fully finance by taxes and that the taxes-to-GDP ratio will be ten percent.

In recent years, the Iranian government has experienced budget deficits, making it increasing difficult to finance public services. To achieve the aforementioned objectives of the Fifth Development Plan and to reduce budget deficits, the Iran Tax Organization can obtain new income resources by expanding the tax base. Unlike developed countries, labor wage tax in Iran makes up only 14% of total government tax revenues, while income tax on businesses contributes 48%. Thus, labor wage tax is not considered an important source of government revenue. Besides the collection function, the tax on labor wage can have many other important functions: it allows for an allocation of economic resources without distorting relative prices; it can be an important tool for income redistribution through progressive brackets (Wasilewski, 2005).

For these reasons, increasing tax rate on labor wage is necessary for Iran economy. However, increasing tax rates on labor wage can affect labor work effort and can influence the aggregate labor supply, government revenue and expenditure, output of the economy and other economic variables. It is important to be able to
estimate the economic effect of taxes reform so that policy–makers can make better informed judgments about policy proposals. There are two ways to estimate the economic effects of policies; partial equilibrium and general equilibrium analysis. The selection of a computable general equilibrium (CGE) is useful for evaluating tax policies changes because it captures the full impact of tax change on the economy. Therefore, this paper attempts to develop and use computable general equilibrium model to examine the economic impacts of increasing labor wage tax in industrial sector on the Iran economy.

IRANIAN'S TAX SYSTEM COMPARED TO OTHER COUNTRIES

Total tax revenue relative to GDP is one of the important indicators for understanding the role of tax revenues. Table 1 gives this ratio for Iran economy. This ratio is 7.3, 6.8 and 7% in the years 2005, 2006 and 2007, respectively. This index virtually has been unchanged in Iran's economy. This ratio for 2005 is 26.8, 33.5, 30 and 49.7% in the United State, Canada, Switzerland and Denmark, respectively. In developing countries like South Korea, Turkey, South Africa and Czech Republic, the ratio in 2005 is 15.8, 32.3, 25.8 and 38.5, respectively. Given this data, Iran's ratio appears quite small. Table 2 shows the financial structure of Iranian government revenue.

In recent years, the tax collection in Iran has been increased and the share of oil revenue has been declined. Because, the tax to GDP ratio was almost constant from 2005 to 2007, authorities have not been successful to expand the tax base. The share of indirect and direct taxes from total tax revenue for Iran has been given in Table 3. Share of enterpriser income tax is the highest amount and it has remained constant. The trend of labor wage tax has increase.

In developed country, most of the government's income comes from labor wage tax. The labor wage tax to GDP ratio in 2001 is 12.2, 13.3, 9.8 and 26.3% in the US, Canada, Switzerland and Denmark, respectively. In developing countries like South Korea, Turkey and Czech Republic, the ratio in 2001 is 3.8, 7.7 and 4.8, respectively. This ratio for Iran is 0.83, 0.87 and 0.9% in the years 2005, 2006 and 2007, respectively. With regard to this data, it is observed that Iranian authorities can increase and expand the labor wage tax base to obtain new revenue resources. The structure of labor wage tax in Iran is progressive, with tax rate ranging from 10 to 35%, in 5 brackets.

LITERATURE REVIEW

Multisectoral models (MMs) have increasingly become popular in applied economics since the input-output (I-O) model was developed by Leontief (1936). In general, MMs are based on general equilibrium (GE) theory and capture the interaction between commodity and factor markets and decision making agents in an economy. General equilibrium broadly refers to the Walrasian competitive model in which all economic agents are price takers who maximize profits or utility, and prices freely adjust to equilibrium to clear markets.

The analytical goal of general equilibrium model is to determine a vector of prices for both consumers and producers of goods and services that will clear all markets. The optimal allocation of resources is determined by equilibrium prices, given endowments of labor and capital (Dervis et al., 1981). CGE analysis has progressed quite rapidly since the pioneering work of Johansen (1960). In this multisectoral study, Johansen, applied the general equilibrium model to the Norwegian economy. Johansen (1960) reduced the highly linear model to a class of log-linear equations and then solved it by matrix inversion.

In addition to Johansen's method of linearizing the CGE model and solving it by simple matrix inversion, there are other solution techniques in the literature to execute the CGE models. First, based on the fixed-point algorithm pioneered by Scarf Herbert (1973), a CGE model can be solved by finding a fixed point in a mapping of prices to prices through excess demand equations. Secondly, the solution of CGE model can be formulated by finding the shadow prices that can be interpreted as market price. Finally, it is possible to treat a CGE model as a system of non-linear algebraic equations directly solved by different numerical techniques. In the late 1970s, CGE modeling was directed toward analyzing income distribution issues of developing countries.

The Adelman-Robinson model of Korea is the first effort to examine the distribution of income in a CGE setting (Adelman and Robinson, 1978). This model focuses on the distribution of income among the various socioeconomic groups. Dervis, de Melo and Robinson's "General Equilibrium Models for Development Policy" (1981) is a major contribution to the GE theory for developing countries. In this work, the authors discuss how distributional phenomena can be included in the CGE models for developing countries, and also how international trade in a multisectoral setting can be treated within a CGE framework. The main significance of this work comes from addressing the issue of incorporating trade and international capital flows to the development policy in developing economies.

The study of tax incidence analysis using computable general equilibrium approach was pioneered by Harberger (1959, 1962). Harberger model is two factors, two sectors, general equilibrium model in which a tax applies to the use of one factor (capital) in one sector. Arnold Harberger solved his model using a series of approximations and local linearization assumption. Shoven and Whalley (1972, 1973) were the first to analyze
Table 1. Share of Taxes in GDP.

<table>
<thead>
<tr>
<th>Year</th>
<th>Tax revenue</th>
<th>GDP</th>
<th>GDP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>134,574</td>
<td>1,831,737</td>
<td>7.3</td>
</tr>
<tr>
<td>2006</td>
<td>151,621</td>
<td>2,224,093</td>
<td>6.8</td>
</tr>
<tr>
<td>2007</td>
<td>191,815</td>
<td>2,882,236</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Website of Iran Central Bank, the value of numbers is milliard Rial, Iran currency.

Table 2. Financial structure of Iran government revenue.

<table>
<thead>
<tr>
<th>Source of revenue</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue</td>
<td>%</td>
<td>Revenue</td>
</tr>
<tr>
<td>Oil</td>
<td>186,342</td>
<td>48</td>
<td>181,881</td>
</tr>
<tr>
<td>Tax</td>
<td>134,574</td>
<td>35</td>
<td>151,621</td>
</tr>
<tr>
<td>Other</td>
<td>66,753</td>
<td>17</td>
<td>80,426</td>
</tr>
<tr>
<td>Total</td>
<td>387,669</td>
<td>100</td>
<td>413,928</td>
</tr>
</tbody>
</table>

Source: Website of Iran Central Bank, the value of numbers is milliard Rial, Iran currency.

Table 3. Share of taxes in total tax revenue.

<table>
<thead>
<tr>
<th>Source of revenue</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue</td>
<td>%</td>
<td>Revenue</td>
</tr>
<tr>
<td>Enterprise income tax</td>
<td>64,460</td>
<td>48</td>
<td>72,362</td>
</tr>
<tr>
<td>Labor wage tax</td>
<td>15,254</td>
<td>11</td>
<td>19,451</td>
</tr>
<tr>
<td>Wealth tax</td>
<td>4,316</td>
<td>3</td>
<td>5,378</td>
</tr>
<tr>
<td>Tariff</td>
<td>35,954</td>
<td>27</td>
<td>39,806</td>
</tr>
<tr>
<td>Consumption tax</td>
<td>14,591</td>
<td>11</td>
<td>14,123</td>
</tr>
<tr>
<td>Total</td>
<td>134,574</td>
<td>100</td>
<td>151,621</td>
</tr>
</tbody>
</table>

Source: Website of Iran Central Bank, the value of numbers is milliard Rial, Iran currency.

taxes using full general equilibrium computational procedure. In their 1972 paper, an artificial commodity is used to incorporate the tax distortions, which effectively limits the applicability of the analysis to one tax at a time. In 1973, they developed a procedure to deal with several simultaneous tax distortions without using artificial commodities. Scarf’s algorithm enables the existence of tax equilibrium to be shown and also provides a method through which such equilibria can be computed. Two models closely related to the Shoven-Whalley work are those by Piggott (1980) on Australia and Serra-Puche (1984) on Mexico. Piggott’s model differs from the other tax models in using two stage constant elasticity of substitution (CES) production functions with differing types of capital and labor. Tax policy reforms in developing country have recently received attention by economic researchers. For example, Cordano and Balistreri (2010) used CGE model for estimating the Marginal Cost of Public Funds (MCPF) for Peru. Giesecke and Hoang Nhi (2010) evaluated the value-added tax systems in Philippine by using a dynamic CGE model. Ulussever (2011) extended a financial CGE model to explore the consequences of changing the government deficit financing options on macroeconomic variables in the Turkish economy under both fixed and flexible interest rate regimes. As authors know, there is no study about labor tax policy by CGE approach for Iran economy. However, Karami et al. (2011) used CGE model to evaluate the effects of removing food subsidy on Iran economy. Ghadimi (2008) applied a dynamic computable general equilibrium model to examine the issues related to optimal extraction of oil resource for Iran economy.

IRAN COMPUTABLE GENERAL EQUILIBRIUM MODEL

The CGE model used in this study is a standard computable general equilibrium model. Our model follows the work of Dervis et al. (1981); Lofgren et al. (2002). In our model, labor, capital and intermediate inputs are used in the production process. The produced good is then transformed into an export good and a good for the domestic market using a constant elasticity of transformation (CET) equation. On the consumption side, consumers buy composite commodity goods. A constant elasticity of transformation (GET) function is supposed to
describe the allotment of composite goods into import and locally-produced goods (Armington, 1969). The model accepts the "small country" assumption of fixed world prices for imports and exports.

Total savings come from the household, government, enterpriser and foreign sectors. To determine the investment demand by sector of origin, this model makes use of a capital composition matrix describing each sector's unique capital requirements to produce its own capital well. The following is a description of the model and equations. In terms of notation, the subscripts \( i \) and \( j \) refer to sectors and the subscript \( h \) refers to household income groups.

**Producing sector**

Production includes two-stage, nested CES production functions. At the top level, outputs \((X)\) is CES function of value-added \((V)\) and intermediate inputs \((AI)\):

\[
X_i = \alpha_i \left[ \sigma_i AI_i^{-\sigma_i} + (1 - \sigma_i) V_i^{-\sigma_i} \right]^{1/(1 + \omega_i)}
\]

\(\alpha_i\) and \(\delta_i\) are shift and share parameters, respectively. The first-order condition (FOC) of optimization of production function is:

\[
\frac{AI_i}{V_i} = \left[ \frac{\sigma_i PV_i}{(1 - \sigma_i) PAI_i} \right]^{\omega_i/(1 + \omega_i)}
\]

\(PV_i\) is the price of value-added and \(PAI_i\) is the price of intermediate inputs. It is assumed that Intermediate inputs are used with a fixed-coefficient technology (Leontief function) while the value-added are defined as a CES function that lets substitution between capital and labor.

\[
V_i = \beta_i \left[ \theta_i L_i^{-\omega_l} + (1 - \theta_i) K_i^{-\omega_k} \right]^{\omega_l/(1 + \omega_l)}
\]

The FOCs of the value-added CES function give Equations (4) and (5).

\[
\frac{L_i}{V_i} = \left[ \frac{\theta_i PV_i}{\beta_i \omega_l PK_i} \right]^{\omega_l/(1 + \omega_l)}
\]

\[
\frac{K_i}{V_i} = \left[ \frac{(1 - \theta_i) PV_i}{\beta_i \omega_k PK_i} \right]^{\omega_k/(1 + \omega_k)}
\]

Based on the fixed-coefficient function, the demand for intermediate goods by sector of origin is defined as follow:

\[
INT_i = \sum_j A_{ij} AI_j
\]

Where the \(A_{ij}\)'s express the input-output coefficients and \(\sum_j A_{ij} = 1\).

The price of intermediate inputs is equal to weighted average of the price of each composite good \((PC)\).

\[
PAI_i = \sum_j A_{ij} PC_j
\]

For each activity, total revenue \((PX_i)\) net of taxes is fully distributed to the value of intermediate inputs and value-added.

\[
PV_i V_i = PX_i (1 - TA_i) - PAI_i AI_i
\]

For labor market clearing, the total labor demand should be equal to total labor supply \((LST)\).

\[
\sum L_i = LST
\]

The sectoral capital stock \((K)\) is distributed across sectors in fixed proportions \((KD)\) of total capital stock in the economy \((KST)\). The supply of capital in the economy provides the capital requirements for each section.

\[
\sum_i K_i = KD_i KST
\]

**Household sector**

Owners of primary inputs earn income from labor and capital. Labor is owned only by the households. However, capital income \((YK)\) is distributed among households, government, enterpriser and foreign sectors in fixed proportions for each sector. Capital income is obtained from the following equation:

\[
YK = \sum_i PK_i K_i
\]

where \(PK\) is the price of capital and \(K\) is the capital stock. \(KH, KGD\) and \(KED\) are the household share, the government share and the enterprisers share in the
capital income, respectively. Total labor income and household capital income are distributed to each household group by the labor income shares (LSD) and capital income shares (KSD). Households pay taxes and insurance to the government. Income tax imposed on households income is given by the following equation:

$$ THY_h = \left( PL_r \sum_i L_i \cdot LSD_i \right) + YK \cdot KH \cdot KSD \cdot THY_h $$

$$ (12) $$

$THY_h$ represents the average household income tax and life insurance rate. In addition of income, other sources of income for the households are transfers from the government ($TRG$) and surplus from enterprisers ($YE$) to households and foreign remittances ($TRF$). These transfers are paid as fixed share for each institution.

$$ Y_h = \left( PL_r \sum_i L_i \cdot LSD_i \right) + YK \cdot KH \cdot KSD \cdot (1 - THY_h) $$

$$ + TRG \cdot TRGD_h + TRF \cdot TRFD_h \cdot ER + YE \cdot YE_h $$

$$ (13) $$

The household savings is a fixed proportion ($SR_h$) of household income.

$$ HHS_h = SR_h \cdot Y_h $$

(14)

Other equations are the household expenditure which determines the household demand for composite goods in accordance with a Linear Expenditure System (LES) demand function:

$$ C_{ih} = PC_i \cdot CM_{ih} + \left( A_{ih} \left( Y_h \cdot (1 - SR_h) \right) - \sum_i CM_{ih} \right) $$

$$ (15) $$

Where $CM_{ih}$ is a fixed, subsistence level of expenditure of good $i$ by household $h$, $A_{ih}$ is the marginal propensity to consume parameter. According to the LES demand function, all goods are normal, all pairs of goods are net substitutes and demand is inelastic with respect to its own price. These results are less restrictive than the unitary price and income elasticities of the Cobb-Douglas demand function. The consumption good demanded from each sector is:

$$ C_i = \sum_h C_{ih} $$

(16)

**Enterpriser sector**

$TER$ Represents the average enterpriser's income tax, thus the enterpriser income tax that is pay to government is obtained from the following equation:

$$ TEY = TER \cdot YE $$

(17)

The main income earned by enterpriser is capital income. Other sources of income are transfer from the government ($TRG$) and infra-institutional ($YE$).

$$ YE = \left( PL_r \sum_i L_i \cdot LSD_i \right) + YK \cdot KED \cdot (1 - TER) $$

$$ + TRG \cdot TRGD + YE \cdot YEED $$

(18)

Enterpriser’s expenditure ($EE$) is payment of enterpriser income tax ($TEY$) and infra-institution transfers to households ($YE$) and enterpriser ($YE$). The rest of the enterpriser income will be saved ($ESAV$).

$$ EE = YE \cdot YEHD + YE \cdot YEED + TEY + ESAVE $$

(19)

Total government expenditure ($GTOT$) is exogenous in the model. The government consumption demand is a fixed proportion ($GEP$) of the total expenditures:

$$ GEP = \sum_i HHT_i \cdot C_{ih} $$

$$ (21) $$

Government savings ($GSAV$) is equal to government revenue minus government expenditures and transfers to the nongovernmental institution.

$$ GEP \times GTOT_i $$

(20)

fixed proportion (GEP) of the total expenditures:

$$ G_i = GEP \times GTOT_i $$

(21)

Government savings ($GSAV$) is equal to government revenue minus government expenditures and transfers to the nongovernmental institution.

$$ EG = \sum_i PC_i \cdot G_i + \sum_k TRG \cdot TRGD_k + GSAV $$

$$ + TRG \cdot TRGED + TRG \cdot TRGD $$

(22)

**Foreign sector**

The model incorporates the small country assumption. The domestic prices of exports and imports ($PE$ and $PM$)
depend on their respective world prices (WPE and WPM) which are exogenously determined.

\[ PE_i = WPE_i(1 + TE_i)ER \]  \hspace{1cm} (23)  
\[ PM_i = WPM_i(1 + TM_i)ER \]  \hspace{1cm} (24)

where ER, TE and TM is exchange rate, tax on export and tax on import, respectively. The model assumes imperfect substitution between imported and domestically-produced goods. Thus, domestic composite goods purchases \( Q \) are defined as a CES aggregation of locally-produced goods \( D \) and imports \( M \).

\[ Q_i = \theta_2 \left[ \gamma_2 M_i^{-\rho_{dlt}} + (1 - \gamma_2)D_i^{-\rho_{dlt}} \right]^{-\frac{1}{\rho_{dlt}}} \]  \hspace{1cm} (25)

The FOC gives the relative level of imports to domestically-produced goods.

\[ \frac{M_i}{D_i} = \left[ \frac{\gamma_2 PD_i}{(1 - \gamma_2)PM_i} \right]^{-\frac{1}{\rho_{dlt}}} \]  \hspace{1cm} (26)

Likewise, it is assumed that production \( X \) is a CES function of exports \( E \) and domestic sales \( D \).

\[ X_i = \theta_1 \left[ \gamma_1 E_i^{-\rho_{e}} + (1 - \gamma_1)D_i^{-\rho_{e}} \right]^{-\frac{1}{\rho_{e}}} \]  \hspace{1cm} (27)

The relative level of exports to domestic sales is, therefore:

\[ \frac{E_i}{D_i} = \left[ \frac{\gamma_1 PD_i}{(1 - \gamma_1)PE_i} \right]^{-\frac{1}{\rho_{e}}} \]  \hspace{1cm} (28)

The average of domestic export price (PE) and domestic goods price (PD) determine price of outputs (PX). Similarly, the price of the composite good (PC) is determined by PD and PM (domestic price of imports).

\[ P_iX_i = PDD_i + PE_iE_i \]  \hspace{1cm} (29)  
\[ PC_iQ_i = PDD_i + PMP_iM_i \]  \hspace{1cm} (30)

**Closure**

**Investment and savings**

Total saving \( TOTSAV \) is equal to sum of savings from the household, government, enterpriser and foreign sectors.

\[ TOTSAV = \sum_h HHS + GSAV + ESAV + TKF.ER \]  \hspace{1cm} (31)

The components of investment are inventory investment \( INV \) and capital expenditures \( KDELT \).

\[ KDELT = TOTSAV - \sum_i INV_iPC_i \]  \hspace{1cm} (32)

Inventory investment defines as a fixed proportion (INVP) of each industry's output.

\[ INV_i = INVP_iX_i \]  \hspace{1cm} (33)

Capital expenditures by sector of destination are determined by constant shares \( KDELP \) of capital expenditure.

\[ \sum_j B_{ij}PC_iKDEL_j = KDELP_j.KDEL \]  \hspace{1cm} (34)

Capital expenditures by sectors of origin \( IND \) are defined as following equation:

\[ IND_i = \sum_j B_{ij}PC_iKDEL_j \]  \hspace{1cm} (35)

\( B_{ij} \) are the elements of capital composition matrix. The coefficients \( B_{ij} \) denote the proportion of capital good \( j \) in one unit of capital goods produced by sector \( i \).

**Market equilibrium**

Market clearing in the goods market states that supply of composite goods must be equal to demand.

\[ \text{Max } Q_i = C_i + INT_i + IND_i + INV_i + G_i \]  \hspace{1cm} (36)

**Foreign accounts**

Market equilibrium for foreign sector implies that foreign capital inflow \( TKF \) must be equal to the difference between the revenue of the foreign sector from imports and its expenditures on exports and transfers to both household and government sectors. In this model, the level of foreign savings is exogenous and the exchange rate is the equilibrating variable which balances the...
revenues and expenditures.

\[ TKF = \sum_i WPM_i M_i - \sum_i WPE_i E_i - TRF \]  

(37)

**Numeraire**

The price index \( PINDEX \) is a weighted sum of the prices of composite goods and it is fixed at one.

\[ \sum_i \Omega_i PC_i = PINDEX \]  

(38)

**Solution procedure**

The generalized algebraic modeling system (GAMS) was used to solve the nonlinear equations of Iran CEG model.

**SOCIAL ACCOUNTING MATRIX**

CGE is one of the important methods for analyzing the effects of economic policies. These models according to each country's economic structure are designed and with using I-O table and social accounting matrix (SAM) are quantified and used. A well-established data is necessary for any CGE model to capture the effects of the economics policy.

Input-output table shows all the inter-industry transactions, but it does not the overall picture of the economy. SAM is a balanced matrix which provides a picture of a market economy for a given year. A SAM is the integration of input-output table and national income accounts. It does not only present the inter-industry flows but also includes all the transaction in the economy.

The rows of SAM shows revenue and the columns represent expenditures. The budget constraint, therefore, requires that the row and column sum must be equal. Until now, in Iran four SAM has been codified. Aggregate social accounting matrices for Iran are presented based on 1999 figures.

This SAM has been developed by central bank of Iran. This SAM includes 53 activities and 112 commodities accounts. The institutions contain households, government, enterprisers and the rest of the world. In this study, in order to facilitate the analysis and interpretations of simulation results, 53 activities accounts are aggregated into five activity accounts including: Agriculture, oil and gas, industry and mining, construction and services. Similar aggregation follows in the commodity accounts. The household accounts are distributed into rural and urban. For this distribution, the data of household budget survey in 1999 are used. This data is provided by Iranian Statistical Center. Aggregate SAM that has been used in this study presented in Table 4.

**CALIBRATION OF PARAMETERS IN THE MODEL**

In order to solve the model, it is necessary to define the value of all parameters appearing in the equations of the model. There are two kinds of parameters in CGE models. The share parameters are calculated directly from SAM and the behavioral parameters that are needed to estimate or obtain from the other relevant literature. "Calibration" is a popular method for calculating the behavioral parameters. To begin to calibrate CGE model an appropriate benchmark period is chosen. The period may be one year or in average of several years. The benchmark period is assumed to be in equilibrium for a given set of existing policies. Thus, the benchmark data is equilibrium data, that is demand for all factors and outputs is equal to their supply at the existing benchmark relative prices.

After specifying the utility and production functional forms, the benchmark parameters of these functions are established by a calibration process such that the obtained parameters can reproduce the benchmark data. Simply put, calibration is using benchmark data to solve for benchmark parameters. The parameters needed for the CES import and export function was obtained based on calibration procedure. The values of household expenditure function are based on some study done on the Iran economy.

Finally, author used translog linearization of the two-input CES function and econometric methods to estimate the values of parameters on the production function and value added function.

**SIMULATION RESULTS**

Here the study reports the comparative static simulation results of Iran CGE model that has been discussed previously. The base year for the experiments is 1999. We compare the estimates results of a number of tax policy reforms by the base year.

In our model, it is assumed that labor mobility is higher than the capital, thus allocation of labor is done easily by the wage changes while the sectoral capital share has been fixed. Another assumption is price normalization that means consumer price index consider to be fixed. Considering these assumptions, we describe three simulations to examine the consequences of possible changes that occur in Iran economy due the increase labor wage tax in industrial and mining sectors. The policy issues addressed in this paper are 5, 10 and 15% increase in labor wage tax in industry and mining sectors. The effect of these scenario simulations on some

<table>
<thead>
<tr>
<th>Sector</th>
<th>Commodities</th>
<th>Activities</th>
<th>Labor</th>
<th>Capital</th>
<th>Household</th>
<th>Enterpriser</th>
<th>Government</th>
<th>Inventory</th>
<th>Investment</th>
<th>Rest of world</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commodities</td>
<td>698,039</td>
<td>241,572</td>
<td>246,257</td>
<td>62,823</td>
<td>6,357</td>
<td>128,289</td>
<td>93,116</td>
<td>778,414</td>
<td>698,039</td>
<td>347,030</td>
<td>1,051</td>
</tr>
<tr>
<td>Activities</td>
<td>106,128</td>
<td>106,108</td>
<td>177,738</td>
<td>29,460</td>
<td>9,479</td>
<td>51,066</td>
<td>109,906</td>
<td>124,068</td>
<td>6,357</td>
<td>6,357</td>
<td>96,254</td>
</tr>
<tr>
<td>Labor</td>
<td>347,030</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>14,068</td>
<td>3,310</td>
<td>77,190</td>
<td>19,209</td>
<td>10,291</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterpriser</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
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<td></td>
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<tr>
<td>Inventory</td>
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<td></td>
</tr>
<tr>
<td>Investment</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rest of world</td>
<td>66,307</td>
<td>1,072</td>
<td>0</td>
<td>807</td>
<td>69</td>
<td>27,999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>778,414</td>
<td>698,039</td>
<td>107,180</td>
<td>347,030</td>
<td>322,785</td>
<td>109,906</td>
<td>124,068</td>
<td>6,357</td>
<td>162,646</td>
<td>96,253</td>
<td>2,752,677</td>
</tr>
</tbody>
</table>

Source: Website of Iran Central Bank, the value of numbers is milliard Rial, Iran currency.

Table 5. Percentage changes in macroeconomics variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross domestic production</td>
<td>-0.024</td>
<td>-0.048</td>
<td>-0.074</td>
</tr>
<tr>
<td>Urban household income</td>
<td>-0.418</td>
<td>-0.811</td>
<td>-1.183</td>
</tr>
<tr>
<td>Rural household income</td>
<td>-0.422</td>
<td>-0.819</td>
<td>-1.194</td>
</tr>
<tr>
<td>Government revenue</td>
<td>0.870</td>
<td>1.696</td>
<td>2.483</td>
</tr>
</tbody>
</table>

important macroeconomics indicators is shown in Table 5. As Table 5 shows, the increase of the labor wage tax rate in industry and mining sector may cause Iran's GDP and household income to decline from the benchmark level while the government revenue would increase.

The percentage changes in GDP measures the taxes efficiency. In all cases, taxes efficiency is lost and efficiency loss is less than 0.01%. Percentage of decreasing household income for urban and rural household is about equal. We interpret the main channels for these changes. Increasing labor wage taxes through the labor supply and goods demand channels affects on Iran's economy.

**Secrotal effects**

The sectoral effects are represented in Tables 6 to 8. First of all, we interpret the effect on labor input. Regarding total labor force is assumed to be constant, increasing labor wage taxation in industry and mining sectors does not affect on total employment in economy but it will change the structure of sectoral employment (Table 6). As expected, imposed taxes on labor wage lead to workforce reduction in industry and mining sectors and it makes to increase employment in other sectors. The highest percentage increase in employment is related to oil and construction sectors. It should be noted that the share of agriculture, oil, industry, construction and services employment in total employment is, 24, 1, 18, 11 and 46%, respectively. Due to the increase of labor wage taxes in the industrial sector, agriculture and services sectors would experience decrease in output price, while the remaining sectors, especially industry would see increase (Table 6).

It should be mentioned that the percentage change of oil output price is completely related to
Table 6. Percentage changes in labor input.

<table>
<thead>
<tr>
<th>Sector</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>0.404</td>
<td>0.787</td>
<td>1.153</td>
</tr>
<tr>
<td>Oil and gas</td>
<td>1.490</td>
<td>2.911</td>
<td>4.267</td>
</tr>
<tr>
<td>Industry and mining</td>
<td>-1.146</td>
<td>-2.231</td>
<td>-3.260</td>
</tr>
<tr>
<td>Construction</td>
<td>0.540</td>
<td>1.048</td>
<td>1.527</td>
</tr>
<tr>
<td>Services</td>
<td>0.252</td>
<td>0.491</td>
<td>0.717</td>
</tr>
</tbody>
</table>

Table 7. Percentage changes in domestic production and price of output.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Production</th>
<th>Price of output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>0.004</td>
<td>0.007</td>
</tr>
<tr>
<td>Oil and gas</td>
<td>0.032</td>
<td>0.061</td>
</tr>
<tr>
<td>Industry and mining</td>
<td>-0.174</td>
<td>-0.342</td>
</tr>
<tr>
<td>Construction</td>
<td>0.287</td>
<td>0.552</td>
</tr>
<tr>
<td>Services</td>
<td>0.072</td>
<td>0.138</td>
</tr>
</tbody>
</table>

Table 8. Percentage changes in household consumption.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Urban</th>
<th>Rural</th>
<th>Urban</th>
<th>Rural</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>0.081</td>
<td>0.077</td>
<td>0.157</td>
<td>0.150</td>
<td>0.229</td>
<td>0.218</td>
</tr>
<tr>
<td>Industry and mining</td>
<td>-0.647</td>
<td>-0.647</td>
<td>-1.260</td>
<td>-1.267</td>
<td>-1.843</td>
<td>-1.853</td>
</tr>
<tr>
<td>Construction</td>
<td>-0.730</td>
<td>-0.734</td>
<td>-1.421</td>
<td>-1.428</td>
<td>-2.075</td>
<td>-2.086</td>
</tr>
<tr>
<td>Services</td>
<td>0.065</td>
<td>0.061</td>
<td>0.125</td>
<td>0.118</td>
<td>0.181</td>
<td>0.170</td>
</tr>
</tbody>
</table>

change in domestically output oil price and in our model the world price of oil will not affect by tax policy reform in Iran. Table 6 also shows that the production falls in industrial sector and it rises in other sectors. The highest and smallest increases in output occur in construction and agriculture sectors, respectively. Because the share of agriculture, oil, industry, construction and services output in total output is, 13, 8, 30, 8 and 42%, respectively, and regarding two amount of sectoral output percentage changes, total output in Iran economy decreased. Increasing labor wage tax in industrial sector causes household final demand goes down in industry and construction sectors and go up in other sectors. These results are contradictory to our prior expectations.

In the sectors that the output price has increased, household final demand decreases and where the price has gone up, household final demand has declined. For example, increasing labor wage tax in industrial sector by 15% makes to decrease in household final demand for industry and construction sectors by -1.8 and -2% and it causes to increase in household final demand for agriculture and services sectors by 0.2 and 0.17%. For better interpretation, it is useful that the composition of household final demand is considered. The share of agriculture, industry, construction and services consumption in total household final demand is, 19, 45, 1 and 35%, respectively. Also it is noticeable that in all sectors, percentage change of final demand for urban and rural household nearly was the same (Tables 7 and 8).

Conclusions

The Iranian government revenue high dependency on oil sales caused the country to experience a severe reduction of infrastructural development when the international price of oil fell down. The Iranian policy maker changed their strategy by focusing on non-oil revenue such as taxes. Despite of emphasis of the Third and Fifth Socio-Economic and Cultural Development Plan for increasing the taxes revenue to GDP ratio, it has been nearly constant. Thus, the Iranian government has failed in achieving their objectives. In most countries one of the major sources of government revenue is wage labor tax but in Iran, it does not play a major role. In this regard, the government should increase the wage labor tax base to reduce dependency on oil as a major source of income. However, any tax policy reform impact on economic variables and the policy maker for better judgments should be inform about the consequences of policy changes. Therefore, the main purpose of this study is to explore the effects of increasing wage labor tax rate
in industrial sector on Iran economy by applying a CGE model.

As author knows, there is no study about the effects of wage labor tax reform on Iran economy using CGE model. Therefore, this study would be useful for decision makers. It contacted three simulations to examine the consequences of possible changes that occur in Iran economy due the increase labor wage taxes. The policy issues addressed in this paper are 5, 10 and 15% increase in labor wage tax in industry and mining sectors. The results of analysis show that increasing wage labor tax rate in industrial sector will decrease GDP and household income and it will increase government revenue. For example, 20% in the wage labor tax rate would have negative effect on the GDP. Gross domestic production (-0.074%), urban household incomes (-1.183%) and rural household incomes (-1.194%) all decreased in the economy and the government revenue (2.483%) increased. Also, imposed tax on wage labor in industrial sector caused laborforce of industrial sector move to another sectors. Thus output of industrial sector decline and output of other sectors increased.

REFERENCES
Managing innovations in telecommunications industry in Nigeria

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Of all the challenges faced by managers today, the management of technological innovation (MTI) is one of the most demanding. Get it right and firms create value and profit. Get it wrong and firms can face serious and perhaps terminal problems, losing money, workers, and reputation. This will lead to revenue loss, company closures and increased unemployment. The objective of this study was to assess the level of innovation in Nigeria's telecommunications industry. The aim was to ascertain how innovative the operators in the industry are which in turn determines how competitive the industry is. Data was collected from available literature on the telecommunications industry. The study proved that there are innovative activities being carried out by the various operators but there is still a lot of room for improvement. The study also found out that government and regulatory authorities need to do more in the area of infrastructural development and policy formulation to ensure a level playing field for both the old and new entrants. The study recommended that all stakeholders in the telecommunications industry, especially the regulator, shareholders, sponsors/directors, top management, and the government, should ensure that there is an innovation strategy in place which should be managed to ensure a high level of productivity and competition amongst the various operators. The study concluded that most of the service providers do not have designed corporate innovation strategies or processes. Furthermore, there are no agents of innovation and innovation teams across the various organizations; champions who will assist the project manager with the implementation and tracking of ideas, innovations and changes. Therefore, there is the need by the various service providers to breakdown functional barriers in their various organizations. However, it is equally important for these organizations to minimize the impact of hierarchies so that a seamless flow of ideas is made possible.

Key words: Telecommunications, management of technological innovation (MTI), infrastructural.

INTRODUCTION

Of all the challenges faced by managers today, the management of technological innovation (MTI) is one of the most demanding. Get it right and firms create value and profit, develop sustainable competitiveness, become vibrant and conducive places to work, attracting and retaining the most productive and creative staff. Get it wrong and firms can face serious and perhaps terminal problems, losing money, workers, and reputation. In the vast majority of business sectors, if firms do not innovate, their competitors will, and they will be put out of business (Dodgson et al., 2008: 1). The service sector has become innovation intensive and some of the significant sectors are the computer and telecommunications services (Howells, 2000: 4). Miozzo and Soete (2001: 4) posit that telecommunications belongs to a group of network services, which are dependent on information technology networks. The development of information technology (IT) has facilitated improvements in the complexity, precision and quality of services offered by these
providers (Tether and Metcalfe, 2003: 2).

However, there have been rapid economic and structural changes happening all over the world over the past decade. This has led to an agreement especially in the developing economies, in support of a market-oriented (private sector-led) approach to growth and recognition that competitive markets and entrepreneurial activities facilitate a more well-organized resource allocation. These developments show that in order to gain competitive advantage and growth, organisations have to create new products/services, which means they have to be innovative to survive. Innovation has long been argued to be the engine of growth regardless of the condition of the larger economy. Whilst competitive advantage can come from size or possession of assets, etc., the trend is increasingly favouring those organisations that can organize knowledge development, technological skills and experience to create new products, processes and services (Trott, 2003: 834-855).

Furthermore, IBM identified ICT as one of the main drivers of innovation needed to help accelerate Africa’s participation in the global economy. IBM’s global innovation output report 2009 stated that, “those African nations that can craft aggressive policies to nurture these drivers will quickly emerge as leaders within Africa and on the global stage” (African investor, 2010). Therefore, the prime objective of managers lies in improving efficiencies and enhancing sustainable competitiveness in their organizations. Technology and innovation helps managers to meet these objectives. Successful MTI occurs when the entire range of innovative elements and activities of organizations are well managed and effectively combined within an innovation strategy. This allows firms to fulfill their overall purpose: be it profit generation, growth, better quality and range of delivery, great market share, or increased employee remuneration, job security or satisfaction.

MTI encompasses all those elements of firms where developing and using technological innovation improves capacity to meet objectives. It includes the management of innovation strategy, innovation communities and networks, research and development (R&D), design and new product and service development, operations and value delivery. While there are many incentives to innovate, there are considerable obstacles to success. MTI often involves managing in circumstances where there is a high degree of ambiguity, uncertainty and risk. As technological innovation is for many firms the primary means of competing in the knowledge-intensive economies of the twenty-first century, MTI is a vital activity (Dodgson et al., 2008: 1).

Therefore, in this bustling world of technological change, managers often find themselves overwhelmed by the number of choices that are available when making technology-related decisions. Most managers will readily admit that it is difficult if not impossible to accurately predict future technological advances. Nevertheless, senior managers in most successful firms in today’s fast pace, “on-demand” world should understand the nature of technological change and evolution. They should know enough to be able to create reasonably accurate forecasts, and take advantage of high value technology investments and energizing markets opportunities to maintain or grow their market shares (Adomavicius et al., 2006: 1).

**Statement of the problem**

Can creativity and innovation be managed? This question has yielded different answers and different opinions. But, it is not farfetched to say that innovation is directly proportional to the attitude of senior management. Thus, without a corporate strategy to reach defined corporate goals, innovation will be misdirected and unguided (Heskett, 2007). Innovation is viewed as the core business competency of the 21st century and in order not to only compete and grow but to survive in a global economy, businesses must innovate. To date, innovation has been approached in a piecemeal fashion often linked solely to the New Product Development (NPD) process (project-leaders.net).

Also, innovation is about creating something new out of nothing. In the modern world of globalisation, innovation is of prime importance to any company or organisation for performing well. It has been observed that most organisations stop growing in most cases, after reaching a certain stage, as their leadership always tried to maintain the status quo and discouraged innovative thoughts and actions through the corporate strategies they adopt (Heskett, 2007). Thus, availability of the right resources may act as a catalyst but creativity will not flourish if organisations do not have a culture of encouraging and supporting innovation. Therefore, the single most important element to foster an innovative culture in an organisation, is to have in leadership at all levels, people who are not only missionaries in their zeal but also courageous enough to face critics (Heskett, 2007).

It is important to note that Nigeria’s economy grew by 6.9% in 2009, led by the expansion in Nigeria’s telecoms industry. The oil and gas sector shrank by 1.2% while the telecommunications industry, Africa’s biggest, expanded by 34.2% in 2009 (Bloomberg Business Week, 2009). As Nigeria targets to be one of the top twenty economies in the world by the year 2020, there is a need to encourage in our various organisations, leaderships that will drive innovative strategies that will help in realising this target objective. This is most pertinent in our telecommunications industry because commercial activities in the 21st century is carried out mostly through information and communications technology like, e-banking, e-commerce, e-payment, e-education, e-health, e-agriculture etc. and also because of the importance of
the industry to Nigeria’s economy. We need the organisational leadership that will foster and drive our telecommunications industry towards achieving successful innovative strategies that will make them highly competitive internationally.

Afeikhena (2002: 1-3) writing on public enterprise reform in Nigeria, an evidence of the telecommunications sector, using Nigerian Telecommunication Limited (NITEL) as a case study, concluded that only competition and private participation will guarantee long-term improvements in the telecommunications sector. The success of deregulation can only be calculated in terms of falling rates and improved service availability. He also averred that sluggishness in undertaking regulatory change can have negative effect on the economy through slow diffusion of new technologies and services, economic inefficiency, and retarded employment growth opportunities. In essence, unless organizations are prepared to renew their products and processes on a continuing basis their survival chances are seriously threatened (Tidd et al., 1997: 12). This will lead to revenue loss, company closures and increased unemployment.

Objectives of the study
The objectives of this study were:

1) To ascertain the impact of innovation on the level of competition in Nigeria’s telecommunications industry;
2) To assess the influence of management challenges on innovation in the telecoms industry;
3) To examine the extent at which innovative activities has led to the growth of telecommunications industry in Nigeria.

RESEARCH METHODOLOGY
The paper is a qualitative study which is based on secondary data. The study was carried out through a meta-analysis of reports on the telecoms industry. Relevant literatures on innovation and telecommunication industries were reviewed, which led to insight and stimulating research.

THEORETICAL FRAMEWORK
Service innovation
It is often useful to think of services as either intermediation activities, such as transport, that arise because consumers want to separate production and consumption, or contact services, such as haircuts, telephone calls, or medical services, where production involves the consumer directly and where the output of the activity is embodied in the consumer. An important aspect of a service is the relationship between production and consumption, that is, goods can be produced meaningfully without consumers (think of a firm producing a car), whereas services require the consumer (a haircut, or repairing a car). Innovation is the successful exploitation of new ideas – this definition applies to all firms in the economy and is equally relevant to services innovation. While innovations in tangible products may be more easily recognized, possibly due to their physical and ‘codifiable’ nature, there is wealth of excellent examples of services innovation as would be explained:

Airport runway space
Landing planes is a classic service that is intangible and jointly produced by air traffic control and the service users (airline carriers). Despite runways having been ‘full’ for many years, year after year major airports continue to increase capacity. This has been achieved by ongoing innovations including improved efficiency in ground operations, greater co-ordination between relevant actors and developments in technology that have facilitated safer spacing of landing times. Much of this has been achieved without additional runways being built.

Financial services
Many banks now offer a whole range of services online, facilitated by ICT, and recently there have been developments such as open plan – which is a process/business model innovation, introduced by the Woolwich that enables customers to access and link all their financial holdings (savings and current accounts, mortgage, etc.) through one portal. Open plan customers can use both traditional methods of communication such as branches and automated teller machines, and more recent channels such as telephone call centre, internet and digital television.

Air flights
While the core offer of airlines remains transport between destinations there has been considerable innovation in this area, for example: Low-fare carriers (for example, Ryanair, EasyJet) have transformed the airline industry and the travel industry in general. This business model innovation emerged in Europe from the deregulation of European airspace in the 1990s; similar models such as that operated by South West were already operating in the US.

Retail
There have been many innovations in retail services, but perhaps one of the most pervasive has been through use of bar codes. The introduction of bar code scanners linked to information and communication technology has transformed retail. It required retailers to undertake several non-technological changes (for example, changes to distribution networks, delivery procedures, etc) to take full advantage of the new technology (e.g. more efficient inventory management, measuring the effect of promotions, etc..) (Crespi et al., 2006).

LATEST DEVELOPMENTS IN THE NIGERIAN TELECOMS SECTOR
The telecommunications industry in Nigeria is currently undergoing rapid change and phenomenal growth. Over the past decade in particular, the Nigerian telecommunications industry has begun to deliver for the residential and business consumer. This recent development is as a result of the liberalization of the sector and the resulting competition by private operators (NCC, 2005: 2). The
Nigerian personal mobile business has been very pivotal to the growth of the telecoms industry in Nigeria. Developing from a 30,000 line subscriber base at the beginning of the millennium to 9.174 million connections at the end of 1994 and 75 million in 2010, the personal mobile business has been an outstanding success. Nigeria is now officially the largest growth market for telecommunications in Africa and the Middle East, and possesses the most dynamic fixed and mobile telephony in Africa (NCC, 2005: 4).

Furthermore, in terms of competitive market structures, mobile telecommunication has become the strongest telecoms sub-sector, as all four competing operators; MTN, GLOBACOM, AIRTEL and ETISALAT engaged the market aggressively. In almost all aspects, the mobile business displays the characteristics of a vigorously competitive market with operators declaring profits, consumers enjoying lowering prices under a stable and fairly consistent regulatory regime (NCC, 2005: 4-5).

Innovation in Nigeria’s telecoms industry

“If you cannot compete on price you have to differentiate, and to differentiate you have to innovate!” (Bruce, 2007: 1). As a result of competition in Nigeria’s telecommunications sector, the operators had to be more innovative in order to keep the existing customers as well as attract new customers. This led to operators coming out with a variety of innovative packages meant to add value for money. Some of these innovative packages are explained as follows:

VIRA game

This is a chain promotion that allows MTN subscribers to earn more money by sending a special text to at least 10 other MTN subscribers. This is meant to attract more subscribers to MTN network so that they can send texts and earn money.

Fast mail

This service provides customers with access to information via e-mails anytime, anywhere. It provides an e-mail account of about 10MB storage space with a customised e-mail account, which subscribers can access via SMS or the internet. In addition, subscribers can re-direct e-mails from their corporate intranet to their MTN fast mail account such that they can access their official mails via MTN fast mail account at their convenience (mtonline.com).

MTN family and friends expanded

This is a new prepaid plan that allows you to register up to 10 family and friends numbers and enjoy rates as low as 17 kobo per second on calls to your MTN registered numbers and 20 kobo per second on calls to other networks that you register as your family and friends.

Special micro SIM cards

MTN has introduced special micro SIM cards compatible with the new models of smart devices and tablet PCs. These new micro-SIM cards are smaller in size than the standard SIM card and specially manufactured for devices including the Apple Ipad and Iphone 4. The Micro SIM will facilitate enjoyable and convenient Internet access via the MTN SIM Plus menu.

DSTV mobile TV service

MTN is enriching lives by providing access to a world of information and entertainment via the DSTV mobile TV service. You can now catch all the exciting moments LIVE from Big Brother Africa All Stars on your DSTV Mobile phone. (Simply use 12345 as the parental code to start watching Big Brother All Stars live on your DSTV mobile). What's more? You also get 10 other exciting DSTV channels on your Nokia 5330 Mobile TV phone whenever you're on the move.

MTN eye

This package assists the subscriber in knowing exactly when to set out on a journey and informs your decision on the most appropriate route to use to get to your destination. MTN eye would save you valuable time and money. Now motorists travelling into or around Lagos can take the guess-work out of their travel, thanks to Nigeria's first traffic monitoring and advisory service from MTN Nigeria. MTN eye is not a surveillance or security system. Neither is it intended for any security related purposes. The videos have a low resolution so they are not usable for any kind of recognition of faces, vehicle number plate, etc. MTN eye from MTN Nigeria is Nigeria's first commercial traffic monitoring and advisory service which gives traffic advisory information to MTN Nigeria subscribers via their mobile phones or computers. The video mode or video service is accessed via your mobile phone web browser or your computer browser. Once on the MTN eye site, simply search for the street/location of interest from the list of covered areas and click on it to view the traffic video. The video service delivers a 10 s video footage, showing the current traffic situation on the location requested. The clips are updated every 3 min.

MTN who called and notify me

With MTN who called and notify me, MTN keeps you up to speed with calls you missed while your phone was switched off or unreachable while also sending you an SMS message when a number you could not reach becomes available. The SMS message with information about calls you missed or numbers you could not reach will be sent to your mobile phone as soon as your mobile number becomes available or as soon as the number you attempted to call becomes available.

Conference call

GLO mobile offers a conference call service to some of its subscribers. This feature allows subscribers to hold a conference call with, up to five mobile or landline numbers.

Vehicle tracking

Vehicle tracking solution is the ability of corporate customers to track, locate and communicate with their vehicle, fleet and valuable assets using an integration of global system for mobile communications (GSM) and global positioning system (GPS) technology, and being visualized in a geographical context. The vehicle and assets can also be monitored for fuel consumption, speeding, tampering with goods, tyre pressure; emergency alerts etc. with this solution, corporate customers have real time information on their fleet and ensure the best run for their
Glo mobile office

This is a general packet radio services (GPRS) based service that will allow subscribers to access their Microsoft exchange mail, appointments, calendar and tasks directly on their mobile phone. The service can also allow subscribers use their corporate applications like sales force automation and customer relationship management systems directly from their mobile phones (NCC, 2005: 6).

Glo power box

This is a Glo customized phone that is not expensive and has a lot of benefits for the consumer who is intent on maximizing their resources. The cost of the Glo power box is N2000 but customers will get N3000 worth of benefits in a year. The benefits include; free G2G airtime of N200 monthly for N600 12 months - N2400, 10 free G2G SMS monthly for 12 months, free night calls, Up to 20% bonus on recharge.

Glo quick teller

Glo quick teller gives you convenient access to an array of services including recharge, bill payments, donations and state government payments. From DSTV bills, to HiTV bills, to PHCN bills and recharge that actually tops up your line. This is what quick teller brings to you. Quick teller services are available not only at www.quickteller.com.ng, but also at bank ATMs, select merchant locations, and via your bank’s internet banking portals.

The Glo UK top up card

This is a Globacom network credit voucher which subscribers roaming in the UK and Ireland can buy and top up their phones. Nigerians in the Diaspora can also purchase the cards and send the PINs to their friends, families and associates in Nigeria on the same Glo Mobile network.

Glo wonderful offer

It is a prepaid tariff plan which rewards the customer with free minute on a call for every minute spent on the call. The customer pays for one minute and gets the next minute of that call free, irrespective of the call being on net or off net. The features include; pay for one minute, Glo pays for the next minute of the call, effective rate as low as N7.50/min for on net calls and N12.50/min for off net calls, 20 free Glo-to-Glo SMS per month, 10 to 20% free Glo-to-Glo bonus Talk time on every recharge of N1 000 and above, 35 h free Glo-to-Glo talk time per week, from 12 midnight to 5 am, upon usage of N500 in previous week.

Etisalat you and me

Etisalat you and me allow easy starter customers enjoy “free credit” every week to call a loved one’s Etisalat number anytime. All the customer has to do to enjoy this fantastic offer is to register that special Etisalat number by dialing “233*1*etisalat number#”, recharge with a minimum amount weekly to get the additional “free credit”. The customer will get the “free credit” during the week they recharged up to the minimum amount. The credit can only be used to call the registered you and me number. Validity period for the free credit is 7days.

Etisalat dotme

This is a new SMS-based bulletin board service which allows customers share information and stay connected with their contacts while on the go. You can instantly publish information or status updates via SMS from your mobile phone at any time. The service is entirely based on SMS so having access to the Internet or a smart phone is not necessary.

Etisalat easylife

Etisalat easylife allows the customer to enjoy; 20k to call anyone, anytime on any network anywhere in 9ja, 20k to call anyone, anytime in US (mobile and land line) and UK (land line), 20 free SMS daily (etisalat to etisalat lines), Enjoy bonus on incoming calls (free ‘credit’ to call any network anytime you receive calls from other networks).

Airtel club 10

It allows the subscriber to enjoy discounted rates on calls and SMS; also get free mid-night calls to your members! Simply make 1 min of a local call between 8 am and midnight to enjoy the free midnight call benefit. Get free data valid for 1 week after a recharge of N200 or more within one week. Other benefits include; add 9 Airtel lines to yourself to form a club of 10, make calls to your members at 10k/s**, SMS your club members at N1/1SMS, make free midnight calls 12.30 and 4.30 am daily to club members, call other Airtel numbers at 20k/s*, SMS other Airtel numbers at /N3SMS, calls to other networks are only 30k/s*, SMS other networks at N5/SMS, calls to US, Canada, UK*, India and China at 20k/s after your 1st min at 60k/s, free 10MB data valid for 1 week after a recharge of N200 or more within one week.

Airtel easy recharge (ERC))

This is a service that gives Airtel valued customers the unique opportunity to top-up their phones, or that of friends and family virtually without using a scratch card. ERC is denominationless (flexible) and any value from N50.00 can be purchased.

Airtel mobile office

With Airtel mobile office, you can access your office calendar, contacts, and email. Email when you are away from your desk - your office - even your laptop. With just your Airtel phone. Also works with Microsoft® Outlook and IBM® Lotus notes view your daily schedule, or past and future appointments.

Airtel corporate package (ACP)

This is a premium package which gives the additional benefits of lower tariffs, option of paying in arrears for your airtime usage, unlimited talk-time controlled by credit limit options, and a wide range of value added services. This package is available both as postpaid and hybrid enabling you to top up with recharge cards. It is targeted at all levels of staff within your organization giving flexibility
we compete in the value chain? And how should we compete if we capture value, there are certain questions that come to mind. What kind of technology evolve? And how will the market change? In order to properly respond to change. Effective strategies answer three key questions, namely, how can we create value? How will the business environment and adapting resources and competences so as to take advantage of these (Johnson and Scholes, 2002: 10). This is sometimes known as the search for strategic fit. Strategic fit is developing strategy by identifying opportunities in the business environment and adapting resources and competences so as to take advantage of these (Johnson and Scholes, 2002: 10). Strategy is the need to make a choice. It enables organization to properly respond to change. Effective strategies answer three key questions, namely, how can we create value? How will the market change? In order to capture value, there are certain questions that come to mind, namely, how should we design the business model? Where should we compete in the value chain? And how should we compete if

Airtel football community service

Airtel football community service is a unique value added services that provides Airtel customers the opportunity of receiving SMS updates on the English Premier League for the four biggest clubs Manchester United, Arsenal, Chelsea and Liverpool. These update includes match fixtures, breaking news, league table, goal updates (half time and full time scores) Post match analysis and many more.

INNOVATION SYSTEMS MANAGEMENT

Innovation is often about small, incremental changes to products, services and processes. It also needs the involvement of all managers in every department from finance to customer services. Innovation is therefore a strategy that needs to be formulated and managed as a core business process covering all parts of a business. More than that, it should be integrated into the business in both strategic and operational levels.

It is also the core business skill and process for the 21st century and as with other core business processes; innovation needs to be linked to strategy and the business planning process. Innovation separate from business strategy runs the risk of diverting key resources and damaging the focus of an organization. Innovation activities must be driven by strategy and current business imperatives. The extent and type of innovation should be determined by current business performance and future expectations and by an organization's tolerance to risk. How far innovation is integrated with a business strategy is also dependent upon a business appetite for risk and its risk profile. Different types of innovation strategies and projects have different risks (innovationtools.com).

Business strategy

Within organizations there is a fundamental tension between the need for creativity and the need for stability. On the one hand, companies require stability and static routines to accomplish daily tasks efficiently and quickly. This enables the organization to compete in today's world. For example the processing of millions of cheques by a bank daily, or the delivery of food by multiples to retail outlets all over the country, demands high level of efficiency and control. On the other hand, companies also need to develop new ideas and new products to be competitive for the future. Hence, they need to nurture a creative environment where ideas can be tested and developed. This poses one of the most fundamental problems for management today.

The ways in which firms manage the tension between the need to be creative and efficient is termed strategy, and is concerned with the long-term direction of an organization. Strategic decisions are normally about trying to achieve some advantage for the organization over competition. It is the matching of the resources and activities of an organization to the environment in which it operates. This is sometimes known as the search for strategic fit. Strategic fit is developing strategy by identifying opportunities in the business environment and adapting resources and competences so as to take advantage of these (Johnson and Scholes, 2002: 10). Strategy is the need to make a choice. It enables organization to properly respond to change. Effective strategies answer three key questions, namely, how can we create value? How will the technology evolve? And how will the market change? In order to capture value, there are certain questions that come to mind, namely, how should we design the business model? Where should we compete in the value chain? And how should we compete if standard are important? In terms of delivering of value it is necessary to ask the following questions, namely how do we manage the core business and growth simultaneously? How do we use our strategy to drive real resource allocation? (Birkinshaw and Mol, 2006).

Innovation strategy

In a business environment where innovation provides distinctive and sustainable competitive advantages, innovation strategy is the basis for the firm's overall strategy. Innovation strategy involves analysis of firms' business, market, and technological environments and consideration of what resources they have to draw upon. It involves making choices about innovation in uncertain and ambiguous circumstances, with diverse strategies for different levels of uncertainty. It entails building innovative capabilities firms need, to meld skills and resources to analyze, select, and deliver innovation to enhance organizational performance. It requires consideration of how new initiatives fit with firms' existing portfolio and how innovation strategy complements overall corporate strategy. It is concerned with integrating all the areas of MTI into a coherent whole (Dodgson et al., 2008: 3).

An innovation strategy guides decisions on how resources are used to meet a firm's objectives for innovation and thereby deliver value and build competitive advantage. Its crafting is supported by a number of innovative capabilities that steer the configuration and reconfiguration of a firm's resources. It entails judgments about which kinds of innovation processes are most appropriate for the firm's circumstances and ambitions. An innovation strategy identifies the technologies and markets the firm should best develop and exploit to create and capture value. It does so within the limits of the resources available to the firm to support current and future innovation efforts and its evolving corporate strategy, organization and culture.

Innovation strategy is different to mainstream business strategy because it needs to comprehensively accommodate uncertainty. As such, many common approaches to business strategy are inappropriate for innovative businesses. Some uncertainty is always present in strategic management of incremental innovation, but is a major strategic factor in radical innovation (Dodgson et al., 2008: 95).

Elements of innovation strategy

There are four interrelated elements involved in innovation strategy namely enacted strategy itself, resources available for innovation, innovation capacity and innovation process used to deliver result. The enacted strategy itself including its targets and 'fits' with overall company strategy, existing innovation efforts, and the context in which, it operates. The identified targets are the technologies and markets that managers believe will create and deliver best values for their firms. The resources available for innovation are the assets a firm owns and to which it has preferential and secured access. The innovation capabilities guide and enable those resources to be assessed, configured and reconfigured. The innovation processes used to deliver results are the combinations of management and organization around R&D, new product and service development, operations, and commercialization that deliver innovation.

Innovation strategy helps to focus attention on how these resources, capabilities, and processes are best developed and deployed to meet corporate objectives (Dodgson et al., 2008: 95). There are often more opportunities for innovation than resources available, and choices have to be made. Choices should be linked to the anticipated economic benefits and the ability to appropriate returns from innovation. They need to fit with the overall corporate
strategy, deciding whether or not innovation targets complement the firm's available resources and existing innovation portfolio and whether ambitions match its organizational structure and culture. The choices made should include attention to issues of timing; whether, for example, a firm aims to be a proactive innovator or to be a reactive follower. These decisions help to prioritize resource allocation, providing a focus for marshalling and integrating different components of innovation processes and guiding them towards specific markets and customers within the competitive environment (Dodgson et al., 2008: 96-97).

Focus of strategy

There is the need for managers to learn how to build parallel structures and activities that would not only permit these two opposing forces to coexist but would also balance them in some integrative and meaningful way. Typically, such pressures are controlled through formal structures and through formal job assignments to project managers who are then held accountable for the successful completion of product outputs within established schedules and budget constraints. At the same time there must be an "upstream" set of forces that are less concerned with the specific architectures and functionalities of today's products but are more concerned with the various core technologies that might underlie the industry or business environment not only today but also tomorrow. They are, essentially, responsible for the technical health and excellence of the corporation, keeping the company up-to-date and technically competitive in their future business areas.

In every technology-based organization, the forces that represent this dualism compete with one another for recognition and resources. The conflicts produced by this competition are not necessarily harmful; in fact, they can be very beneficial to the organization in sorting out project priorities and the particular technologies that had to be monitored and pursued, provided there are mechanisms in place to both support and balance these forces. How a firm fashions its strategies towards this dualism depends on its objectives. It is sometimes surprising to learn that not all companies' first and foremost objective is growth. Some companies are established to exploit a short-term opportunity. Other companies, particularly family-run ones, would like to maintain the company at its existing size. At that size the family can manage the operations without having to employ outside help (Trott, 2003: 835-844).

Generally speaking, the more the organization tries to operate only through formal mechanisms of organizational procedures, structures, and controls, the more the organization will move towards a functioning organization that drives out its ability to experiment and work with new technological concept and ideas. More informational organizational designs and processes are therefore needed to influence and support true innovative activity, countering the organization's natural movement towards more efficient production and bureaucratic control (Katz and Allen, 1984: 33-35).

Ensuring an innovative climate

More than ever before, organizations competing in today's world of high technology are faced with the challenges of "dualism" that is, functioning efficiently today while planning and innovating effectively for tomorrow. Not only must these organizations be concerned with the success and market penetration of their current product mix, but they must also be concerned with their long run capability to develop and incorporate in a timely manner the most appropriate technical advancements into future product offerings. Research and development-based corporations, no matter how they are organized, must find ways to internalize both sets of concerns (Katz and Allen, 1984: 1). In order to enhance the innovation process for the more timely introduction of new technologies into the corporation's product portfolio, the general proposition is that these areas of informal activity need to be managed within R&D setting, strengthening and protecting them from the pressures of the "productive" organization in order to increase the organizations willingness and ability to deal with the many advancements that come along, especially with respect to new areas of technology. It has been found that changes in formal structure are one of the principal tools by which the organization's executives can continue to keep their company atoned to the current and anticipated future problems the company will face.

As Les Vanaiz of Intel Corporation remarked, 'the beauty of this business is that the technology will always change, the organizations, the organizational interfaces, the customer interfaces, the vendor interfaces'. There's always going to be change, because of the technology. To assume that your organization makes sense today, just because it made sense five years ago to really incorrect. An explicit examination of frequency of organization can be seen by tracing the organizational changes at Hewlett-Packard (Schoonhoven and Jelinek, 1990: 107). Thus, faced with what is clearly a risky and uncertain process many organizations could be forgiven for deciding not to innovate, even though the possible rewards are attractive. However, that approach of doing nothing is rarely an option, especially in turbulent and rapidly changing sectors of the economy. As Drucker (1985: 52) puts it, "structure is a means for attaining the goals and objectives of an institution". So, the requirement is to create a structure which suits the need of the particular enterprise or institution, while achieving consistency between the various aspects of that structure and being able to adapt it to changing circumstance over time (Child, 1974: 179).

Firms therefore, manage this 'tension' by opting for a structure that fits organizational goals, guarantees flexibility and autonomy to project teams, motivates creative processes and integrates the various project teams with the main-line activities of the firm. Innovations and ideas can come from any part of an organisation. It is not the preserve of the R&D department or marketing. Nor is it merely limited to an employee or customer 'suggestion scheme'. The sources of innovation are many and varied but they need to be collated, coordinated and well managed as a source of valuable information and are core to the future of an innovative business (project-leaders.net). Innovation, then, is a dynamic process involving the movement and transfer of technologies across internal organizational boundaries. Formal organizational design, on the other hand, is a static concept, describing how to organize collections of activities within well-defined units and reporting relationships, for example, research, advanced development, product development, engineering, quality assurance, etc.

Formal organizational structures tell us what to manage and with whom to interact within certain areas of interdependent activity; they tell us little about how to move information, ideas, and in particular technological information across functional areas, divisions, or formal lines of authority. In fact, formal structures tend to separate and differentiate the various organizational groupings, making the movement of ideas and technologies particularly difficult across these groupings especially if there are no compensating integrating mechanisms in place.

And it is in the movement of new technological concepts from research to advanced development and to successful product development that we are particularly interested. The effective organization, therefore, needs to cause the results of R&D to be appropriately transferred. Technically successful R&D, especially if it embraces new radical technologies, is very likely to pose major problems of linkages with the rest of the firm, particularly product development, engineering, manufacturing, marketing, sales, field-service, and so on. A company can do a terrific job of R&D and a terrible job of managing the innovating process overall simply.
because the results of R&D have never been fully exploited and successfully moved downstream (Katz and Allen, 1984: 18-19).

Witness, for example, the problems of Xerox where the R&D labs have generated and surfaced many major new advances and approaches only to discover that the company has failed to fully exploit and capture benefit from many of them. Other corporations, on the other hand, have benefited extremely well from Xerox’s research activities - so many in fact that some have suggested that Xerox’s research facilities should be declared a National resource instead of a resource for Xerox (Fortune Magazine, September, 1983).

A successful innovation culture embraces all aspects of a business and should be managed as effectively and efficiently as any other core business process. To this end, successful innovation companies operate an “Innovation Hub” where all ideas and innovations are collated and coordinated (project-leaders.net). Creative processes and analysis can be used to stimulate new ideas in four basic areas namely business innovation- new business or supply chain models; product or service innovation- new or modified products or ways of providing a service; market innovation- opening a new market or creating a new customer base; and process Innovation- improving or changing internal processes (innovationtools.com). Research has indicated that one of the most important factors in installing an innovation culture within any company is having leaders and teams with ability and commitment. Senior managers need to understand the strategic direction and how innovation can help. They also need to be able to motivate others. Creating a culture of continuous innovation requires leadership and commitment from the board and senior management teams (SMTs). This is a ‘must’ – a necessary prerequisite for success. It also requires agents of innovation and innovation teams across the organization, champions who will assist a project manager with the implementation and tracking of ideas, innovations and changes. Managers need to constantly look at their part of the business and ask themselves “what are the barriers to being innovative and creative?”

If there are no boundaries and structure to the innovation process then staff confidence is often affected. If there is no method then the chance of success is reduced. Organizations that truly invest in their people and understand the value of their ideas ensure that facilities, equipment, time and resources are organized to help foster ideas and innovations.

This might be, for example, using facilitators to help engender innovation in business meetings, or setting aside ‘quiet areas’ for people to think through ideas, or even having informal ‘coffee breaks’ where people in different departments who would not normally meet or socialize get together for a quick break and to chat. There are thousands of ways in which staff and management can do things differently and be encouraged to voice their ideas. However, this often runs contrary to the way in which organizations are usually run and jobs designed. It is a key management responsibility, then, for managers to ‘audit’ the organization in terms of how it is structured and its innovation processes.

Finally, like any other core discipline, creating an innovation process and installing an innovation culture must be managed and measured on an ongoing basis. Monthly and weekly meetings should focus on the progress and performance of both new ideas and the implementation projects. Issues should have a process by which they are escalated and associated risks managed where appropriate. The performance of the innovation process and the issues raised should drive and inform the next planning process and review of strategy. Performance has to be linked to strategy and measures and key performance indicators (KPIs) set. The frequency of performance measurement is often dependent upon how critical the innovations are to the overall business performance. Performance measurement is intimately linked to the innovation platform used by the organization. It should give managers real time information on how innovations are progressing and their performance against the selected KPIs (project-leaders.net).

RESEARCH FINDINGS

1) The liberalisation and privatisation of Nigeria’s telecoms industry has led to competition in the industry.
2) Competition has led to the service providers in the telecoms industry striving to outwit each other in value services provision. This has in turn led to innovation in the industry.
3) Innovation in the telecoms sector is still in the primary stage because most of the service providers cannot be distinguished in terms of provision of value added services.
4) There are also some issues about the regulatory framework which needs to be addressed. For example, interconnectivity, effective competition, institutional strengthening, unreliable electricity supply, consumer education and managing consumer expectation etc.
5) Most of the decisions and strategies on innovation in the telecoms industry flow from the top and the management structure in most cases are flat and rigid.

Conclusion

Firms compete successfully when they offer new, better and/or cheaper products and services, which their customers can use to their advantage, and which their competitors cannot provide. Competitive advantage therefore derives from the ability to make and do things cheaper and better, or to make and do new things. It has a relative dimension: advantage is found in the activities of firms compared to their competitors. It also has an absolute dimension: there must be a market for what the firm does. Technological innovation plays a central role in providing comparative and absolute advantages (Dodgson et al., 2008: 2). Innovation in Nigeria’s telecoms industry came about as a result of the recent reforms of the past decade in the industry. But, it is still obvious that a lot needs to be done in the area of value-added-services for the consumers. A close look at the services being offered by the service providers shows that most of them provide basically the same kind of services and operate the same kind of management structure and corporate strategies.

Furthermore, most of the service providers do not have designed corporate innovation strategies or processes. There are no agents of innovation and innovation teams across the various organisations, champions who will assist the project manager with the implementation and tracking of ideas, innovations and changes. There is a need for the various service providers to breakdown functional barriers in their various organisations. Furthermore, it is equally important for these organisations to minimise the impact of hierarchies so that a
seamless flow of ideas is possible.

RECOMMENDATIONS

Research has shown that one of the most important factors in installing an innovative culture within any company is having leaders and teams with ability and commitment. Thus, the following recommendations are made:

1) There is a need for the management in these organisations to adopt a bottom-up approach instead of the top-down deliberate push that is currently in place.
2) Innovation management system must give senior management visibility and control over the innovation process and confidence that best practice tools are being applied appropriately and across the board.
3) There should be provision of a work environment of openness built on trust where every member of the team feels free to express their views/opinions without fear of ridicule or reprisal.
4) Senior managers need to understand the strategic direction and how innovation can help. They also need to be able to motivate others.
5) The various organisations should adopt an integrated approach to managing innovation.

REFERENCES

Full Length Research paper

Bi-criteria flow shop scheduling with fuzzy simulated annealing algorithm

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A new mathematical model for a flow shop scheduling problem is presented in the fuzzy environment. It proposed bi-criteria to be maximized, that is, minimal satisfaction degree with respect to the earliness of jobs and, minimal satisfaction degree of tardiness of jobs. A simulated annealing algorithm was proposed to solve this model in the fuzzy environment. This method was implemented in MATLAB 7.0 software.

Key words: Simulated annealing, bi-criteria, fuzzy, earliness and tardiness penalty, flow shop scheduling.

INTRODUCTION

Scheduling is a major issue faced everyday in manufacturing systems as well as in the service industry, so it is essential to develop effective and efficient advanced manufacturing and scheduling technologies and approaches (Wang, 2003). Flow shop scheduling problem (FSSP) is a class of well-researched scheduling problems with strong engineering background, which represents nearly a quarter of manufacturing systems, assembly lines and information service facilities nowadays and has earned a reputation for being difficult to solve (Nawaz et al., 1983; Wang et al., 2003; Nowicki and Smutnicki, 1996b; Wang and Zheng, 2003; Grabowski and Pempera, 2001).

Since Johnson’s seminal paper in 1954, which analyzed the minimization of the make span in a two-machine flow shop (Johnson, 1954), many researchers have studied flow shop problems. In the recent literature, for the m-machine flow shop scheduling problems, Andresen et al. (2008) presented a simulated annealing and genetic algorithms for minimizing mean flow time in an open shop. Kumar et al. (2000) extended the approach in Sriskanadarrajah and Wagneur (1999) to an m-machine case. Kalir and Sarin (2001) presented a bottleneck minimal idleness (BMI) heuristic to sequence a set of batches to be processed in equal sublots for minimizing make span. Recently, Marimuthu et al. (2008) proposed a genetic algorithm (GA) and hybrid genetic algorithm (HGA) for an m-machine flow shop with makespan and total flow time criteria. More recently, ant colony optimization (ACO) and threshold accepting (TA) algorithms were presented for solving the same problem by Marimuthu et al. (2009). As mentioned before, with the advent and development of JIT manufacturing systems, efforts have been focused on minimizing the total weighted earliness and tardiness penalties for the m-machine lot-streaming flow shop scheduling problems. Yoon and Ventura (2002b) presented a procedure where a linear programming (LP) formulation was designed to obtain optimal sublot completion times for a given sequence and sixteen pairwise interchange methods were utilized to search for the best sequence. Later on, Yoon and Ventura (2002a) proposed a hybrid genetic algorithm (HGA) by incorporating the LP and a pairwise interchange method into the traditional genetic algorithm. More recently, Tseng and Liao (2008) developed a discrete particle swarm optimization (DPSO), where a net benefit of movement (NBM) algorithm was utilized to obtain the optimal allocation of the sublots for a given sequence, and the objective function values obtained by the NBM heuristic are used to guide the search towards the best sequence. In these three recent literatures, only the idling case is addressed. To the best of our knowledge, there is no published paper for dealing
with the lot-streaming flow shop with total earliness and tardiness criterion with respect to the no-idling production interruption time between any two adjacent sublots.

Ng and Kovalyov (2007) considered the problem of batching and scheduling in a flow shop environment with the make span as objective. Yuan et al. (2007) investigated the complexity of two-machine flow shop scheduling with transportation constraints with the makespan as objective. Ng et al. (2010) considered a two machine flow shop scheduling problem with linearly deteriorating jobs with the total completion time as objective and provided a branch-and-bound algorithm. Vallada and Ruiz (2009) proposed cooperative metaheuristic methods for the permutation flow shop scheduling problem with the total tardiness and the make span objectives. The reader is referred to Hejazi and Saghafian (2005) and Cheng et al. (2000) for a survey of flow shop scheduling research. It has been shown that minimizing the make span in an m-machine flow shop is strongly NP-hard for mP3 (Garey et al., 1976). Since then a number of researchers have focused on specially structured flow shops, such as ordered flow shops (Panwalkar and Khan, 1976; Smith et al., 1975; Smith et al., 1976) and proportionate flow shops (Allahverdi, 1996; Hou and Hoogeveen, 2003; Ow, 1985; Lee and Choi, 2010).

Smith et al. (1975, 1976) considered a m-machine ordered flow shop with the make span objective. In Smith et al. (1975), they considered a special case in which job processing times on the first (last) machine are the longest, and showed that the problem can be solved in polynomial time; they also showed that if the first (last) machine is the slowest, then the longest processing time [LPT (shortest processing time (SPT)) sequence is an optimal permutation schedule. Smith et al. (1976) showed that there exists an optimal schedule that has an inverted V-shape that is, all jobs before the job with the longest processing time appear in SPT-order and all jobs after the job with the longest processing time appear in LPT-order.

Several researchers considered the ordered flow shop problem with the objective of minimizing the total completion time. Panwalkar and Khan (1976) addressed an m-machine ordered flow shop problem. They showed that the problem can be solved in polynomial time by sequencing the jobs in increasing order of their processing times. Panwalkar and Woollam (1980) proved that sequencing the jobs in increasing order of their processing times also produce an optimal schedule for the m-machine ordered flow shop problem with no wait.

During the last decade, several works on the scheduling problems (Dubois et al., 1995; Fortemps, 1997; Geneste and Grabot, 1994; Hapke et al., 1994; Ishibuchi et al., 1994a, b; Kuroda and Wang, 1996; McCahon and Stanly, 1990; Roy and Zhang, 1996) used fuzzy logic to model either uncertain or imprecise data or flexible constraints of the problem at hand. In fact, most of the classical methods treat problems where the data are deterministic and the constraints are strict (Dell_Amico and Trubian, 1993; Nowicki and Smutnicki, 1996a; Osman and Potts, 1989; Taillard, 1990) which is far from the cases met in the industry where generally the data are imprecise or flexible and/or some of the problem constraints are flexible. Whereas most of classical methods are not relevant, the fuzzy logic allows the modification of flexible or imprecise parameters. Hence, it corresponds to several situations met in practice, which do not necessarily represent scheduling problems. Most of studies treat classical scheduling problems (problems with 1 or 2 machines, job shop, flow shop and open shop problems) (Hapke et al., 1994; Ishibuchi et al., 1994a, b; Kuroda and Wang, 1996; McCahon and Stanly, 1990) which are only sub-problems of industrial problems. Thus, real industrial problems treated by fuzzy logic are rare. Our study deals with a practical case of scheduling of a production line concerning a firm in the pharmaceutical industry. We have a set of jobs. Each job represents a customer order and consists of a sequence of elementary operations. For each operation, a set of possible machines can process it.

This paper was treated in the fuzzy environment and modeled as a job shop classification of the scheduling problems. A simulated annealing algorithm was proposed to solve this model in the fuzzy environment. This method was implemented in MATLAB 7.0 software.

FUZZY MEMBERSHIP

Triangular fuzzy numbers

A triangular fuzzy number A or simply triangular number with membership function \( \mu_A(x) \) is defined on \( \mathbb{R} \) by

\[
\mu_A(x) = \begin{cases} 
\frac{x - a_1}{a_M - a_1} & a_1 \leq x \leq a_M \\
\frac{x - a_2}{a_M - a_2} & a_M \leq x \leq a_2 \\
0 & \text{otherwise}
\end{cases}
\]

Where \( a_1 \) and \( a_2 \), is the supporting interval and the point \( a_M; 1 \) is the peak (Figure 1). The third line can be dropped.

Triangular trapezoidal fuzzy numbers

A trapezoidal fuzzy number A or shortly trapezoidal number (Figure 2) is defined on \( \mathbb{R} \) by

\[
\mu_A(x) = \begin{cases} 
\frac{x - a_1}{b_1 - a_1} & a_1 \leq x \leq b_1 \\
\frac{1}{b_2 - a_2} & b_1 \leq x \leq b_2 \\
\frac{x - a_2}{b_2 - a_2} & b_2 \leq x \leq a_2 \\
0 & \text{otherwise}
\end{cases}
\]
It is a particular case of a fuzzy number with a flat. The supporting interval is $A = [a_1; a_2]$ and the flat segment on level $\alpha = 1$ has projection $[b_1; b_2]$ on the x-axis. With the four values $a_1; a_2; b_1$ and $b_2$, we can construct the trapezoidal number. It can be denoted by $A = (a_1; b_1; b_2; a_2)$: If $b_1 = b_2 = a_M$, the trapezoidal number reduces to a triangular fuzzy number and is denoted by $a_1; a_M; a_M; a_2$. Hence a triangular number $(a_1; a_M; a_2)$ can be written in the form of a trapezoidal number, that is $(a_1; a_M; a_2) = (a_1; a_M; a_M; a_2)$.

Similarly to right and left triangular numbers, we can introduce right and left trapezoidal numbers as parts of a trapezoidal number.

The right trapezoidal number denoted $A_r = (b_1; b_1; b_2; a_2)$ has supporting interval $[b_1; a_2]$ and the left denoted $A_l = (a_1; b_1; b_2; b_2)$ has supporting interval $[a_1; b_2]$. Especially they are suitable to represent small $A_r = (0; 0; b_2; a_2)$ (Figure 3a) and large $A_l = (a_1; b_1; b_2; b_2)$ where $b_1$ is a large number (Figure 3b).

**METHODOLOGY**

Consider a problem of N jobs to be scheduled on M machine in flow shop the following assumptions:

(a) No job pre-emption is allowed.
(b) The machine can only process one job at a time.
(c) All jobs are available at the beginning of the scheduling time
A new simulated annealing algorithm approach to defining and solving the flow shop scheduling problem as a fuzzy multi-criteria problem is proposed. The steps included in the fuzzy multi-criteria approach to scheduling are the following:

Step 1: Uncertain scheduling parameters are identified and modeled using fuzzy sets where membership degrees represent a decision maker (DM) (in this case a production manager) preference profile that is satisfaction grade with respect to different parameter values. The membership functions can have different shapes such as semi-linear (for example triangular, trapezoidal) and nonlinear (for example Gaussian function).

In this paper, the fuzzy parameters considered are jobs’ due dates. A fuzzy due date is defined as follows (Ishibuchi and Murata, 2000). Let $c_{kj}$ be the completion time of $j$th job, $j = 1, ..., N$ in the $k$th position.

The membership function of fuzzy due date that denotes degree of satisfaction with respect to tardiness is defined beneath and represented in Figure 4:

$$
\mu_{r_{kj}} = \begin{cases} 
1 & c_{kj} \leq d_{i1} \\
\frac{d_{i2} - c_{kj}}{d_{i2} - d_{i1}} & d_{i1} \leq c_{kj} \leq d_{i2} \\
0 & c_{kj} \geq d_{i2}
\end{cases}
$$

Where the two boundaries: A lower bound $d_{i1}$ and an upper bound $d_{i2}$ are defined. If $j$th job is completed before or at time $d_{i1}$ DM is completely satisfied, that is, the satisfaction grade is 1; if the job is completed between $d_{i1}$ and $d_{i2}$, a linear shape is used to represent the corresponding DM’s satisfaction grade, and finally if the job is completed at or after $d_{i2}$ the DM is completely unsatisfied and the satisfaction grade is 0.

The membership function of fuzzy due date that denotes degree of satisfaction with respect to earliness is defined beneath and represented in Figure 5:

$$
\mu_{e_{kj}} = \begin{cases} 
1 & c_{kj} \leq d_{i1} \\
\frac{c_{kj} - d_{i1}}{d_{i2} - d_{i1}} & d_{i1} \leq c_{kj} \leq d_{i2} \\
0 & c_{kj} \geq d_{i2}
\end{cases}
$$

Where the two boundaries: a lower bound $d_{i1}$ and an upper bound $d_{i2}$ are defined. If $i$th job is completed before or at time $d_{i1}$ DM is completely unsatisfied and the satisfaction grade is 0; if the job is completed between $d_{i1}$ and $d_{i2}$ a linear shape is used to represent the corresponding DM’s satisfaction grade and finally if the job is completed at or after $d_{i2}$ the DM is completely satisfied and the satisfaction grade is 1.

Step 2: This step involves identification and definition of the objectives of interest. In this paper, the scheduling problem under consideration involves two criteria. The two identified criteria are to find a permutation of the jobs in such a way as (1) to minimize the tardiness penalty of all the jobs and (2) to minimize the earliness penalty of all the jobs.

Step 3: Define bi-criteria mathematical model that dissected subsequently.

Step 4: The job permutation is found using a bi-criteria simulated
MECHANICS OF SIMULATED ANNEALING

The idea of the SA algorithm stems from the simulation of the annealing of solids and has been applied to combinatorial optimization problems. It was developed independently by Cerny (1985) and Kirkpatrick et al. (1983). From an arbitrary (starting) solution is of the problem, a solution S_j of the neighborhood of is chosen purely at random. Let \( \Delta j = f(S_j) - f(S_i) \) be the difference in the objective function values of \( S_j \) and \( S_i \). If the objective function value of the new solution \( f(S_j) \) is smaller than or equal to that of the last one (\( \Delta j \geq 0 \)), the new solution becomes the actual one and the search process is continued from \( S_j \). If on the other hand the objective function value of the new solution \( f(S_j) \) is smaller than or equal to that of the last one (\( \Delta j > 0 \)), \( S_j \) is accepted as the actual solution with the probability \( \exp(-\Delta j / C_k) \), where \( C_k \) represents the actual value of the control parameter (temperature). The algorithm starts with a relatively high value of \( C_k \) so that in the beginning most of the inferior neighborhood solutions are accepted. During the execution of the SA algorithm \( C_k \) is usually kept constant for a number of iterations (\( L_k \)) and reduced afterwards, so that the acceptance probability of inferior solutions is relatively small in the end phase of the search process. From a theoretical point of view the iterations with a fixed temperature can be seen as a homogenous Markov chain, which enables a fundamental analysis of the algorithm (van Laarhoven and Aarts, 1987). Thus \( L_k \) indicates the length of the \( k \)th chain. The SA algorithm can be outlined as follows:

Algorithm SA

Step 0: \( k = 1, s_i = S_{\text{start}}, s_i = S_{\text{best}}, C_i = C_{\text{start}} \)

Step 1: Select at random \( S_j \in N(S_i) \)

If \( \Delta j < 0 \) then: \( s_i = s_j \) and if \( f(s_i) < f(S_{\text{best}}) \) then \( S_{\text{best}} = s_i \)

else: if \( \exp(\Delta j / C_k) > \text{random}[0, 1] \) then \( S_i = S_j \)

Step 2: After \( L_k \) repetitions of Step 1: \( C_k+1 = g(C_k) \) and \( k = k + 1 \)
Step 3: If stop criterion is not true go to Step 1.

Along with the definition of the neighborhood \( N(S_i) \) the so-called cooling parameters have to be chosen individually: these are the starting temperature \( C_1 \), the length of a chain \( L_k \), the cooling function \( g(C_k) \) and the stop criterion. There is to the best of our knowledge no overall and problem-independent choice of the cooling parameters which is always dominant to all other settings (Pirlot, 1996); a huge number of theoretically based and empirically tested suggestions are presented in the literature, see, for example Johnson (1954) and for an overview, van Laarhoven and Aarts (1987).

In this paper, we follow the well-known cooling schedule presented in Aarts and van Laarhoven (1985). Thus, for calculating \( C_{\text{start}} \) a short random walk of \( m \) iterations is applied. Let \( m_1 \) and \( m_2 = m - m_1 \), be the number of iterations the objective function decreases and increases, respectively and \( \Delta = \text{the average increase of the objective function value of the } m_2 \text{ iterations. Then}

\[
\text{start} = \frac{\Delta}{\ln(m_1) - \ln(m_2)}\frac{m_2}{m_2 - (1 - x)m_2}
\]

where \( X \) represents the overall acceptance probability of the first \( m \) iterations, which should be chosen close to one. Let \( \mu_k \) and \( \sigma_k \) represent the mean objective function value and its standard deviation of the \( k \)th Markov chain, respectively. The temperature is decreased by

\[
C_{k+1} = g(C_k) = \frac{C_k}{1 + \frac{C_k \ln(1 + \delta)}{3\sigma_k}}
\]

where \( \delta \) is the parameter which controls the cooling process. As the algorithm cools down rather slowly with this parameter setting, the length of the Markov chains is supposed to be relatively small. Aarts and van Laarhoven (1985) suggest terminating the algorithm if

\[
\frac{\partial \mu(c)}{\partial c}(c_k) < \varepsilon
\]

holds, where \( \mu(c) \) is a smoothed function of the average objective function value of different Markov chains and \( \varepsilon \) is a small value. With this stop criterion an extremely large number of iterations may be necessary. Thus we decided not to adopt it but to terminate the algorithm after a fixed number of iterations to make it comparable to the other meta-heuristic approaches. Of course it has to be noted that the results of the SA algorithm are very sensitive due to the parameters of the cooling schedule. Thus, different implementations might be the reason that other comparative studies on meta-heuristics lead to different conclusions than those drawn later on, see, for example, Glass and Potts (1996) or Lin et al. (1995).

**Mathematical model**

\[ i: \text{Index of machines} \quad i = 1, \ldots, M \]

\[ j: \text{Index of machines} \quad j = 1, \ldots, N \]

\[ k: \text{Index of sequence} \quad k = 1, \ldots, N \]

\( C_{kj} \): Completion time of \( j \)th job in the \( k \)th position \( (i = 1, 2, \ldots, N) \)

\( P_{ji} \): The needed time for performance of \( j \)th job on \( i \)th machine.

\( X_{kij} \): The idle time on the \( i \)th machine between the start of the \( j \)th job in the \( k \)th position and completion of the job in the \((k-1)\)th position, \( k=1, 2, \ldots, N \).

\( A_{kij} \): The needed time for performance of \( j \)th job on \( i \)th machine in the \( k \)th position.

\( \alpha_i \): Penalty of earliness for \( i \)th job per hour.

\( \beta_i \): Penalty of tardiness for \( i \)th job per hour.

\( \theta_i \): Weight of earliness for \( i \)th job \( (i = 1, 2, \ldots, N) \)

\( \eta_i \): Weight of tardiness for \( i \)th job \( (i = 1, 2, \ldots, N) \)

\( \mu_{eij} \): Membership function of earliness for \( i \)th job \( (i = 1, 2, \ldots, N) \)

\( \mu_{tij} \): Membership function of tardiness for \( i \)th job \( (i = 1, 2, \ldots, N) \)

\( \lambda_i \): Weight of each criteria against other criteria in objective function \( (i = 1, 2) \)

\[
\min \ z = \lambda_1 \sum_{i=1}^{l} \eta_i (\beta_i \times (1 - \mu_{eij})) + \lambda_2 \sum_{i=1}^{l} \theta_i (\alpha_i \times (1 - \mu_{tij}))
\]

s.t.:

\[
\sum_{j=1}^{N} Z_{jk} = 1 \quad k = 1, \ldots, N \quad (1)
\]

\[
\sum_{k=1}^{N} Z_{jk} = 1 \quad j = 1, \ldots, N \quad (2)
\]

\[
A_{kij} - \sum_{j=1}^{N} (Z_{jk} \cdot P_{jk}) = 0 \quad k = 1, \ldots, N, \quad i = 1, \ldots, N \quad (3)
\]

\[
\sum_{j=1}^{N} (Z_{jk} \cdot P_{jk}) = c_{kj} - \sum_{k=1}^{N} X_{kij} \quad k = 1, \ldots, N, \quad j = 1, \ldots, N \quad (4)
\]

\[
Z_{jk} \in \{0, 1\} \quad i = 1, \ldots, N; \quad k = 0, 1, \ldots, N \quad (5)
\]
If completion time of jth job in the kth position is sooner than \(d_{i1}\), so we will have no tardiness. Its membership degree equals one. Then 

\[ 1 - \mu_{d_{i1}} = 0 \] and first part of objective function which is related to tardiness of jobs become zero. If the completion time of ith job is between \(d_{i1}\) and \(d_{i2}\), the membership degrees:

\[
\frac{d_{i2} - c_{i2}}{d_{i2} - d_{i1}}
\]

Which is subtracted from 1 and multiplied by tardiness penalty of jth job and multiplied by weight of tardiness against another jobs and multiplied by weight of tardiness against another criteria result in the first part of objective function which is the tardiness function.

To calculate the aforementioned model, a PC with the specification of CPU 2.4 GHZ, 512 MB of RAM is used and SA algorithm has been expanded by MATLAB 7.0. To create there supposed questions of which the whole functions are at present zero time and the processing time of the works have been created randomly from the event distribution of [1.5, 3] and multiplied by the tardiness rate.

Since the tardiness penalty is more than the earliness penalty for each order a random number is produced from the event distribution of [1.5, 3] and multiplied by the earliness rate and as a result the amount of delay for the order is obtained. To calculate the delivery time of the jobs as applied in various articles and references regarding single machine questions, the delivery time is equal to \(d = \pi t N(1 - T)\) in which \(T\) is randomly obtain from \(U[0.1, 0.7]\) for each \(N\). The amount of \(\lambda 1\) is calculated by the following formula that \(\alpha 1\) is a random number.

\[
\lambda_1 = \frac{\lambda_i^j}{\sum_j \lambda_j^j}
\]

Table 1, the results obtained from the Lingo8 software calculation and SA calculation for 9 to 2250 dimensions has been compared.

In Table 2 the mean of objective value that obtained from LINGO8 is 0.5553 and the mean of objective value that obtained from SA is 0.4038.

It seems that the mean of LINGO objective value equals the mean of GA objective value. For exact statistical analysis, SPSS16 software was used and was calculated independent sample t test shown in Table 3. As it is clear based on Table 3, that significance value is 0.027 that means equal variances not assumed; and through examining we can consider that the significance value in second row, that is, 0.061 that shows the two means are equal.

As it is clear based on Table 4, that correlations between SA objective value and solution time is 0.817 that means a strong correlations between those and significance value is 0.001 that confirmed it.

It is clear based on Table 5, that correlations between LINGO objective value and solution time is 0.692 that means do not a strong correlations between those and significance value is 0.128 that confirmed it.

As shown in the Table 1, by the increase of the dimensions of the problem the difference between delivery time and the quality of the obtained result by the LINGO8 and SA will be increased. As specified, by the increase of the number of jobs and machine number, mathematical model is not able to provide result whereas in SA algorithm, the time of calculation is highly low. The quality of the result from SA is much better than LINGO8 software as well in (Figures 6 and 7) the function of SA algorithm and LINGO8 are compared.

SUMMARY AND CONCLUSION

In this article, for more real scheduling, the question of just in time production has been considered with two criteria of earliness and tardiness penalty in fuzzy environment. To do so, new mathematical models are presented for the question. With regard to being NP-hard, the method of simulated annealing algorithm (SA) with the use of MATLAB 7.0 software has been developed and then the quality of the results with their time of calculation is compared with the results obtained from Lingo8 and analyzed and the efficiency of SA has been perfectly shown by the expansion of the said model for other state of production such as parallel machine series machine more researchers could done for future works.

Other meta heuristic methods like memetic algorithm, and algorithm, forbidden search algorithm could be used for the presented models as well.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support provided
### Table 1. Comparing LINGO8 and SA.

<table>
<thead>
<tr>
<th>Solution time (second)</th>
<th>Objective value</th>
<th>Algorithm</th>
<th>Machine number</th>
<th>Job number</th>
<th>Number</th>
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</thead>
<tbody>
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<td>0/249</td>
<td>SA</td>
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<td>3</td>
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<td>4</td>
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### Table 2. Group statistics.

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<th>Objective value</th>
<th>VAR</th>
<th>N</th>
<th>Mean</th>
<th>Std. deviation</th>
<th>Std. error mean</th>
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<td>SA</td>
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### Table 3. Independent samples test.

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<th>Parameter</th>
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<th>T-test for equality of means</th>
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</thead>
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<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>5.892</td>
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</tr>
<tr>
<td>Equal variances not assumed</td>
<td>-2.14</td>
<td>0.061</td>
</tr>
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</table>
Table 4. Correlations SA objective value and solution time.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Objective value SA</th>
<th>Solution time SA</th>
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</thead>
<tbody>
<tr>
<td>Objective value SA</td>
<td>Pearson correlation</td>
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</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.817***</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>12</td>
</tr>
<tr>
<td>Solution time SA</td>
<td>Pearson correlation</td>
<td>0.817***</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.001</td>
</tr>
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Table 5. Correlations LINGO objective value and solution time.

<table>
<thead>
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<th>Parameter</th>
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<td>Objective value LINGO</td>
<td>Pearson correlation</td>
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<td>Sig. (2-tailed)</td>
<td>0.692</td>
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<td>N</td>
<td>6</td>
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<tr>
<td>Solution time LINGO</td>
<td>Pearson correlation</td>
<td>0.692</td>
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<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.128</td>
</tr>
<tr>
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<td>N</td>
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</tr>
</tbody>
</table>

Figure 6. Comparing of solution time SA and LINGO.
by the Islamic Azad University, Tonekabon Branch for their kind support and cooperation during field visits and data collection.

REFERENCES


Full Length Research Paper

Investigation of the relationship between real exchange rate uncertainty and private investment in Iran: An application of bivariate generalized autoregressive conditional heteroskedasticity (GARCH)-M Model with BEKK approach

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This paper investigates the relationship between real exchange rate uncertainty and private investment in Iran for the period of 1988 to 2008 by using quarterly data and applying bivariate generalized autoregressive conditional heteroskedasticity (Bivariate GARCH) model in the Iranian economy. We employ this model to examine in a unified empirical framework the interactions between the variables: first, we are interested to know whether there are bidirectional mean spillovers between real exchange rate and private investment. Second, we want to test if real exchange rate uncertainty has a negative impact on investment as predicted by Dixit and Pindyck (1994). Third, we are going to test if private investment uncertainty reduces the level of private investment. The main findings are that there are bidirectional mean spillovers between real exchange rate and private investment. Real exchange rate uncertainty significantly influences private investment and has a negative effect on it. And finally, our empirical evidence shows that private investment uncertainty affects the level of private investment, negatively.

Key words: Real exchange rate uncertainty, private investment, bivariate generalized autoregressive conditional heteroskedasticity (Bivariate GARCH) model, Iran.

INTRODUCTION

This empirical paper investigates the relationship between real exchange rate uncertainty, as the most important index to macroeconomic instability, and private investment in the Iranian economy. Macroeconomic instability refers to phenomena that decrease the predictability of the domestic macroeconomic environment, leading to resource-allocation distortion and hampering investment and growth (Montiel and Serven, 2004).

The empirical evidence suggests that a competitive and stable macroeconomic environment characterized by low and stable internal and external deficits, low inflation and real depreciation of the exchange rate is conducive to higher growth led by significant private investment (Easterly and Schmidt-Hebbel, 1991). Investment raises the production capacity of the economy and promotes technological progress and makes economic growth faster.

In recent years, there has been increasing interest in empirical research relating to explore the relationship between macroeconomic instability and investment (Serven and Solimano, 1993; Pindyck and Solimano, 1993; Aizenman and Marion, 1993, 1995, 1996; Bleaney, 1996; Ismihan et al., 2005; Ahmed and Qayyum, 2007; Imtiaz and Abdul, 2008; Sanogo and Gyengani, 2008; Kottaridi and Escalera, 2008).

Theoretical papers in the case of investment under
uncertainty have a different conclusion about the relationship between them (Hartman, 1972; Abel, 1983; Dixit and Pindyck, 1994; Abel et al., 1996; Lee and Shin, 2000). For example, Dixit and Pindyck (1994) suggested that increased uncertainty reduces investment given the irreversibility of investment projects and, hence, increases the value option of delaying expenditures.

In contrast, Hartman (1972) and Abel (1983) claimed that when the profit function is convex to prices in perfect competition firms, uncertainty will raise the investment. Although, theory predicts that the relationship between exchange rate uncertainty and investment are mixed, depending on assumptions on market competitiveness, risk neutrality, symmetry/asymmetry of investment adjustment costs and entrepreneurial attitudes toward risk (Caballero, 1991; Abel and Eberly, 1994). As Heidari and Pourvaladi (2011) expresses, in developing countries such as Iran in terms of strong economic dependence on crude oil revenue, the issue of exchange rate and its volatility is important.

On the one hand, with real exchange rate decreasing, domestic goods become more expensive than foreign goods and reduce investors export’s income and lead to decrease the private investment. On the other hand, reducing the exchange rate, causes lower prices for imported capital goods, and this makes lower cost for domestic private investors. Moreover, with increasing exchange rate, foreign goods become expensive, this, in turn, reduces consumption and increases the savings as the main source of capital for private investment.

Also, with volatility of real exchange rate, the price mechanism’s efficiency to optimize the allocation of resources will be lost. Our results suggest that the real exchange rate uncertainty is become an impediment to the private investment in Iran.

In the empirical side, there are a lot of empirical investigations about macroeconomic uncertainties and investment with Iranian data in the literature (Gorji and Madani, 2003; Sharifiazadeh and Hosseinizadeh Bahreyni, 2003; Daroughe and Mohammadi, 2005; Gaskar et al., 2007; Moradpour et al., 2008; Kazerouni and Doulati, 2008; Maghari, 2009; Heidari and Pourvaladi, 2011). However, in empirical evidences with other countries data, relationship between exchange rate uncertainty and investment are mixed (Cottani et al., 1990; Goldberg, 1993; Serven and Solimano, 1993; Bleaney, 1996; Darby et al., 1999, 2000; Bleaney and Greenaway, 2001; Bohm and Funke, 2001; Serven, 2002, 2003; Byrne and Davis, 2003; Atella et al., 2003; Becker and Hall, 2003; Byrne and Davis, 2003, 2005; Hallett et al., 2004; Barre et al., 2004; Pradhan et al., 2004; Ruiz and Pozo, 2007; Clause, 2008; Schmidt and Broll, 2009; Heidari and Pourvaladi, 2011), we may conclude that the results of these empirical studies are in line with this general belief that the exchange rate volatility has a negative effect on investment (Bleaney and Greenaway, 2001; Serven, 2002, 2003; Byrne and Davis, 2003, 2005; Ruiz and Pozo, 2007; Clause, 2008; Heidari and Pourvaladi, 2011).

The most important drawback of these studies is that, they have used a univariate GARCH specification for estimation of the uncertainties. Univariate models do not allow studying the joint determination of more than one series. This is a remarkable vacuum of study, as there is a vast theoretical literature that emphasizes the importance of simultaneous effects of series (Brooks, 2002; Tsay, 2005; Minović, 2007). And to the best of our knowledge, there is not any empirical study on assessing the relationship between exchange rate, investment and their respective uncertainties with Iranian data.

Our purpose in this paper is to investigate the relationship between the conditional means and conditional variance of real exchange rate and private investment in Iran. Our base model for explaining the conditional means of the two series is a VAR type GARCH-M (VAR-GARCH-M) model. We simultaneously estimate a time-varying variance-covariance matrix. As the conditional variance is just the variance of the one step ahead forecasting error, the GARCH model seems like a natural choice to study the effects of uncertainty.

The multivariate GARCH-M approach has the advantage that one estimates the uncertainty measure and its effects together in a simultaneous model. Thus the main hypotheses that we are going to test with Iranian data are as follows:

1. There are bidirectional mean spillovers between real exchange rate and private investment.
2. Private investment uncertainty reduces the private investment.
3. Real exchange rate uncertainty affects the private investment.

The rest of the paper is structured as follows. Subsequently, the study outlines our econometric model. Next, it discusses the data. Thereafter, it presents and interprets our main results, and finally, it concludes the paper.

THE MODEL

Since ARCH models were introduced by Engle (1982), these models have become the most popular methodology for modeling uncertainty in the financial time series in the form of conditional autoregressive models. Its popularity can be attributed to its ability to generate time varying measures of exchange rate and private investment uncertainties. Followed this, various ARCH models were considered, most of the models were univariate ARCH models.

The univariate volatility models have a limitation that is assumed the conditional variance of each series is independent from all other series. This could be a
significant limitation as there could be volatility spillovers between variables, which makes the univariate model misspecified. Moreover, the covariances between series also are of interest.

The BGARCH models can potentially overcome these deficiencies of their univariate counterparts. In addition, there are many situations when empirical multivariate models of conditional heteroscedasticity can be used fruitfully (Brooks, 2002).

To estimate the relationships between real exchange rate, private investment and their respective uncertainties simultaneously, we apply a B-GARCH-in-Mean (B-GARCH-M) model. In the applied B-GARCH-M models, the dependent variables in the mean equations are real exchange rate and private investment.

The explanatory variables will contain variables that help to forecast real exchange rate and private investment in mean equations and their uncertainty measures in variance equations. The first step to model a BGARCH model to simultaneously estimate the conditional means, variances, and covariances of variables is specifying the mean equation by testing for serial dependence in the data under consideration.

Estimates of the mean equation for real exchange rate and private investment are based upon the following bivariate model:

\[
[LRER_t] = [\mu_{LRER, t} + \phi_1 LRER_{t-1} + \rho_1 h_{t-1}] + [\epsilon_{LRER, t}]
\]

Where \( LPRI_t, LRER_t \) denote the private investment and real exchange rate, respectively. The residuals, \( \epsilon_{1,t} \) and \( \epsilon_{2,t} \), are assumed to be normally distributed with a time varying conditional variances, which indicate that the mean equation have been effected by innovations at the moment. \( h_{1,t} \) is the conditional variance of the residual term taken as private investment uncertainty at time \( t \) and \( h_{2,t} \) is the conditional variance of the residual term taken as real exchange rate uncertainty at time \( t \). There are several different B-GARCH formulations in the literature, including the \( \text{VECH} \), diagonal \( \text{VECH} \) and the \( \text{BEKK} \) approaches. This paper, however, employs \( \text{BEKK} \) approach.

To illustrate the \( \text{BEKK} \) approach, consider the following equation:

\[
H_t = C + A_1 \epsilon_{t-1} \epsilon_{t-1} + B_1 \epsilon_{1,t} \epsilon_{1,t} + \epsilon_{t} | \psi_{t-1} \approx N(0, H_t)
\]

where \( H_t \) is a 2×2 conditional variance-covariance matrix that is always positive definite, \( \epsilon_t \) is a 2×1 innovation (disturbance) vector, \( \psi_{t-1} \) represents the information set at time \( t-1 \), \( C \) is a diagonal 2×2 triangular and \( B_1 \) as diagonal matrixes are 2×2 and they reflect ARCH and GARCH effects of volatility, respectively (Heidari and Bashiri, 2011).

The diagonal \( \text{BEKK} \) model is given by the following equations:

\[
h_{11,t} = c_{11}^2 + a_{11}^2 \epsilon_{1,t-1}^2 + b_{11}^2 h_{11,t-1}
\]

\[
h_{22,t} = c_{22}^2 + a_{22}^2 \epsilon_{2,t-1}^2 + b_{22}^2 h_{22,t-1}
\]

\[
h_{12,t} = h_{21,t} = c_{12} + b_{12} h_{22,t-1} + a_{12} \epsilon_{1,t-1} \epsilon_{2,t-1}
\]

Under the assumption of conditional normality, the parameters of the BGARCH models of \( \text{BEKK} \) specifications can be estimated by maximizing the following log-likelihood function.

\[
l(\theta) = -\frac{TN}{2} \log 2\pi - \frac{1}{2} \sum_{t=1}^{T} \log |H_t| + \epsilon'_t H_t^{-1} \epsilon_t
\]

where \( \theta \) denotes all the unknown parameters to be estimated, \( N \) is the number of series in the system and \( T \) is the number of observations and other notations are defined before. The maximum likelihood estimate for \( \theta \) is asymptotically normal, and thus traditional procedures for statistical inference are applicable (Heidari and Bashiri, 2011).

**DATA**

This paper uses the real exchange rate and the private investment in the Iranian economy covering the period of 1988 to 2007. All data are in logarithm form and are gathered from Central Bank of Iran (CBI) and International Financial Statistics (IFS) CD-ROM.

Figure 1 shows the logarithm of real exchange rate and private investment in the Iranian economy during 1988 to 2008. As Figure 1 shows the Iranian economy has experienced volatile real exchange rate and private investment during last two decades.

The summary statistics for the data is given in Table 1. The values of the Jargue-Bera statistic for the logarithm
of real exchange rate and private investment imply the deviation from normality at 10% level of significance.

We employ several tests such as Augmented Dicky Fuller (ADF), Phillips-Perron (PP), Ng and Perron (2000) and Kwiatkowski et al. (1992) (KPSS) tests to determine stationary properties of the series. The results of these standard unit root tests in Table 2 are not the same. These results, however, are biased in favor of identifying data as integrated in the presence of structural break. So, we use structural break tests and unit root with structural break tests.

To carry out a test of no structural break against an unknown number of breaks in the variables under investigation, we use the endogenously determined multiple break tests introduced by Bai and Perron (1998, 2003). The results show that using most of these tests, we have breaks in the mean of the series under considerations.

To carry out a unit root test with presence of any structural break, we use Lee and Strazicich (2004) test which introduced a new procedure to capture two structural breaks. Table 3 presents the results of Lee and Strazicich (2004) unit root test.

The results reveals in Table 3 that in the presence of two structural breaks, the null of unit root for logarithm of real exchange rate and private investment are rejected at 1% level of significance.

**Empirical results**

We use a VAR(1)-GARCH-M model to estimate the relationships between real exchange rate and private investment and their respective uncertainties simultaneously. The method for the estimation of parameters which we use is maximum log-likelihood with BEKK approach. The estimated bivariate BEKK model is reported in Table 4.

$\phi^2$, which shows the mean spillovers from real exchange rate to private investment is negative and significant, which means that real exchange rate affects the level of private investment. $\phi^1$, which implies the mean spillovers from private investment to real exchange rate, is negative and significant. Thus, there are bidirectional mean spillovers between real exchange rate and private investment.

The coefficients of real exchange rate and private investment with one lag in their mean equations are positive and significant, which indicates that private investment is affected by its lag value and real exchange rate is positively affected by its lag value.

However, the coefficient of conditional variance of real exchange rate in the mean equation is negative and insignificant, which means that real exchange rate uncertainty does not affect the level of real exchange rate.

Moreover, our empirical evidence shows that real exchange rate uncertainty affects on the investment inversely, supporting, Dixit and Pindyck (1994). This is in line with Goldberg (1993), Serven and Solimano (1993), Bleaney (1996), Darby et al. (1999, 2000), Bleaney and Greenaway (2001), Bohm and Funke (2001) Serven (2002), Atella et al. (2003), Becker et al. (2003), Byrne et
Table 2. ADF, PP, KPSS and NP tests results for logarithm of real exchange rate and private investment.

<table>
<thead>
<tr>
<th>Statistics level</th>
<th>Real exchange rate statistics</th>
<th>Lag</th>
<th>Result</th>
<th>Private investment statistics</th>
<th>Lag</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>τμ (ADF)</td>
<td>-0.8797</td>
<td>0</td>
<td>I(1)</td>
<td>-0.3666</td>
<td>9</td>
<td>I(1)</td>
</tr>
<tr>
<td>τT (ADF)</td>
<td>-1.9650</td>
<td>0</td>
<td>I(1)</td>
<td>-2.2490</td>
<td>9</td>
<td>I(1)</td>
</tr>
<tr>
<td>τ (ADF)</td>
<td>-1.5094</td>
<td>0</td>
<td>I(1)</td>
<td>1.1489</td>
<td>9</td>
<td>I(1)</td>
</tr>
<tr>
<td>τμ (PP)</td>
<td>-0.6518</td>
<td>2</td>
<td>I(1)</td>
<td>-0.7828</td>
<td>5</td>
<td>I(1)</td>
</tr>
<tr>
<td>τT (PP)</td>
<td>-1.8915</td>
<td>1</td>
<td>I(1)</td>
<td>-1.9388</td>
<td>5</td>
<td>I(1)</td>
</tr>
<tr>
<td>τ (PP)</td>
<td>-1.7459</td>
<td>4</td>
<td>I(1)</td>
<td>1.4471</td>
<td>5</td>
<td>I(1)</td>
</tr>
<tr>
<td>τμ(kpss)</td>
<td>0.8936</td>
<td>6</td>
<td>I(0)</td>
<td>0.9948</td>
<td>6</td>
<td>I(1)</td>
</tr>
<tr>
<td>τT(kpss)</td>
<td>0.2301</td>
<td>6</td>
<td>I(0)</td>
<td>0.1611</td>
<td>6</td>
<td>I(1)</td>
</tr>
<tr>
<td>MZαμ(np)</td>
<td>1.0790</td>
<td>0</td>
<td>I(1)</td>
<td>0.4088</td>
<td>9</td>
<td>I(1)</td>
</tr>
<tr>
<td>MZtμ(np)</td>
<td>0.4597</td>
<td>0</td>
<td>I(1)</td>
<td>0.2248</td>
<td>9</td>
<td>I(1)</td>
</tr>
<tr>
<td>MZαT(np)</td>
<td>-8.5271</td>
<td>2</td>
<td>I(1)</td>
<td>-61.861</td>
<td>9</td>
<td>I(0)</td>
</tr>
<tr>
<td>MZTt(np)</td>
<td>-1.9420</td>
<td>2</td>
<td>I(1)</td>
<td>-5.5568</td>
<td>9</td>
<td>I(0)</td>
</tr>
<tr>
<td>Statistics1 difference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>τμ (ADF)</td>
<td>-9.9948</td>
<td>0</td>
<td></td>
<td>-4.3781</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>τT (ADF)</td>
<td>-9.9748</td>
<td>0</td>
<td></td>
<td>-4.3100</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>τ (ADF)</td>
<td>-9.7712</td>
<td>0</td>
<td></td>
<td>-3.6900</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>τμ (PP)</td>
<td>-10.1403</td>
<td>3</td>
<td></td>
<td>-3.9905</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>τT (PP)</td>
<td>-10.1552</td>
<td>3</td>
<td></td>
<td>-3.9742</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>τ (PP)</td>
<td>-9.7894</td>
<td>1</td>
<td></td>
<td>-3.8176</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>τμ(kpss)</td>
<td>0.1370</td>
<td>4</td>
<td></td>
<td>0.0716</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>τT(kpss)</td>
<td>0.0935</td>
<td>5</td>
<td></td>
<td>0.0560</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MZαμ(np)</td>
<td>-39.6509</td>
<td>0</td>
<td></td>
<td>-19.9105</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>MZtμ(np)</td>
<td>-4.4524</td>
<td>0</td>
<td></td>
<td>-3.1551</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>MZαT(np)</td>
<td>-39.4852</td>
<td>0</td>
<td></td>
<td>-21.0938</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>MZTt(np)</td>
<td>-4.4430</td>
<td>0</td>
<td></td>
<td>-3.2438</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

τT represents the most general model with a drift and trend; τμ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. The critical values are obtained from Mackinnon (1991) for the ADF and PP test and from Kwiatkowski et al. (1992) for the KPSS test and from Ng-Perron(2001) for the NP test. Tests for unit roots have been carried out in EVIEWs 6.0.


<table>
<thead>
<tr>
<th>Variable</th>
<th>TB1</th>
<th>TB2</th>
<th>K</th>
<th>t-statistic</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRER</td>
<td>1995Q1</td>
<td>1998Q4</td>
<td>6</td>
<td>-6.5877</td>
<td>I(0)</td>
</tr>
<tr>
<td>LPRI</td>
<td>1993Q4</td>
<td>1996Q3</td>
<td>8</td>
<td>-8.4155</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

(1) The critical values at 1, 5, 10% are -5.823, -5.286 and -4.989, respectively (Lee and Strazicich, 2004).

al. (2003), Serven (2003), Byrne and Davis (2003, 2005), Ruiz and Pozo (2007), Clause (2008), Schmidt et al. (2009) and Heidari and Hashemi (2011), where they find a negative relationship between exchange rate uncertainty and investment for different countries. Our results suggest that the real exchange rate uncertainty seems to become an impediment to the private investment. Therefore, the negative effect of real exchange rate uncertainty on the private investment is higher than real exchange rate, because in Iranian economy real exchange rate uncertainty, because of instability of polices, reduces the price mechanism’s efficiency to optimize the allocation of resources, distorts the real cost of purchasing imported capital goods, intermediate goods and inputs, therefore, the profitability of the private sector is affected and this may reduce private investment. Our empirical evidence also shows that private effect on the private investment. This result means investment uncertainty has a negative and significant level of that private investment equation, the coefficient $\alpha_{11}$ is significant at the 1% level, indicating the
the private investment has time varying variance characteristic. In real exchange rate equation, the coefficients $a_{22}$ and $b_{22}$ are statistically significant at the 1% level, indicating there exist ARCH and GARCH effects.

Equation 1 shows that these models allow for dynamic dependence between the volatility of the series under consideration. Figures 2 and 3 show the conditional covariance and variance of real exchange rate and private investment. It can be seen from the behavior of conditional covariance (Figure 2) that correlation between real exchange rate uncertainty and private investment uncertainty is stable over time.

On the other hand, it has been frequently observed that volatility changes over time. We showed that real exchange rate is more volatile than private investment. In the model, estimated conditional variance of real exchange rate has the greatest peak at the time.

**Conclusion**

Real exchange rate uncertainty, as the most important index to macroeconomic instability, plays an important role in investment decisions. It reduces the price mechanism’s efficiency to optimize the allocation of resources, distorts the real cost of purchasing imported capital goods, intermediate goods and inputs, therefore the profitability of the private sector is affected and this may reduce private investment.

In addition, exchange rate uncertainty may lead to change in real income, and this could modify the production capacity. Also, it affects sectors which produce international traded goods, and thus influence the competitive and export volume.

So, in this paper, we have investigated empirically the relationship between real exchange rate and private investment and their respective uncertainties in Iran for the period of 1988 to 2008 by using quarterly data and applying a VAR-type GARCH-M model. The method for the estimation of parameters which we use is maximum log-likelihood with BEKK approach.

Our empirical results support a number of important conclusions: (1) There are bidirectional mean spillovers between real exchange rate and private investment. (2) Real exchange rate uncertainty significantly influences
private investment and has a negative effect on it, supporting Dixit and Pindyck (1994). (3) Private investment uncertainty affects the level of private investment, negatively. Therefore, in order to increase the private investment, government should create a stable macroeconomic environment.

REFERENCES

Trustworthiness of product review blogs: A source trustworthiness scale validation

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With the introduction of Web 2.0, online blogging has established its place in the lexicon of public relations management. Especially blogs that offer reviews of products, services and technologies, have become essential to practitioners of public relations in their dialogue with the market place. From a public relations perspective, this paper addresses the source trustworthiness of product review blogs among online consumers, and whether consumer demographics have a significant impact on their level of trust. This paper reports the adaptation of a scale to measure the construct of source trustworthiness in the context of blogs. The results of a survey among 169 Australian online consumers confirmed the validity of the scale in the blogging context. Findings suggest that while source trustworthiness does not appear to be strongly related to either gender or level of education, younger consumers exhibit higher levels of source trustworthiness. Managerial implications are drawn from these findings and avenues for future research are identified.

Key words: Source trustworthiness, trust, public relations, product review blogs, blogging.

INTRODUCTION

The Internet has become essential to practitioners of public relations (PR) in their dialogue with the market place as well as with improving the productivity and efficiency in their research and issues management (Ryan, 2003; Sallot et al., 2004; Porter and Sallot, 2005). With the introduction of Web 2.0, the next generation of the Web, blogging has established its place in the PR lexicon (Kent, 2008; Xifa and Huertas, 2008; Smith, 2010).

From simple person-to-person word-of-mouth communications, blogs exponentially amplifies mass consumer-to-consumer communication at an unprecedented level (Vilpponen et al., 2006). Complementary to other types of online social media, blogs not only enable organizations to communicate with all stakeholders, they also enable easy and free communications among stakeholders (Mangold and Faulds, 2009). Unquestionably, communication professionals and practitioners need to understand stakeholder perceptions of blogs and how to most effectively use blogs as part of their communications strategy.

A crucial stakeholder perception to address is their trust in the information provided by blogs and their perception of the trustworthiness of blog writers. Unless trustworthiness is at an acceptable level, organizations will be, and rightly should be, careful if employing blogs in their communications. According to Edelman and Intelliseek’s (2005) survey, “people’s trust has shifted from authority figures to average people, like you.” Their study shows that only 56% of Americans are likely to trust the opinions of physicians and academics to a greater extent than they trust the opinions of people similar to themselves. Their findings support the fact that product review blogs are increasingly popular among consumers. Blog writers who share their opinions with others are numerous and their numbers are growing exponentially, covering all possible genres and topics. While many bloggers are not necessarily experts, consumers tend to increasingly use product review blogs to minimize advertising noise and confusion and to gain an honest peer evaluation of a product, service or technology.
However, a key question is to what extent blog readers perceive these product review blogs as a truly credible source. Many scholars identify ‘trustworthiness’ and ‘expertise’ as two key components of source credibility (Hovland et al., 1953; Self, 1996).

Hovland et al. (1953) have defined expertise and trustworthiness as follows: “Expertise refers to the extent to which a communicator is perceived capable of making valid assertions, while trustworthiness is the degree to which the audience perceives that the communicator intends to convey valid assertions” (Tripp et al., 1994).

An antecedent to source credibility is the nature of the relationship, if any, between the blogger and specific stakeholders in the product, service, or technology under review. Some bloggers receive corporate sponsorship in the form of compensation or other benefits from the related stakeholders such as manufacturers and their agencies. Consequently, there has been concern that some bloggers who review products may not provide truly unbiased reviews and are therefore in violation of good business practices.

From a public relations perspective, this paper specifically addresses the source trustworthiness of these blogs among online consumers, and whether consumer demographics have a significant impact on their level of trust. To confirm these issues, the following hypotheses are formulated:

Scale validity hypothesis: The scale adapted from the traditional concept of source trustworthiness accurately measures the source trustworthiness in the blogging context.

H1: Consumers (blog readers) perceive product review blogs as a trustworthy source.
H2: A significant correlation exists between the perception of blog readers on the source trustworthiness of blogs and basic demographic descriptors such as gender, age and level of education.
H3: A significant relationship exists between the perception of blog readers on the source trustworthiness of blogs and the other consumer blogging behaviors, such as how frequently they access and read blogs and the number of blogs they access.

Therefore in this paper, we begin by briefly reviewing the employment of blogs as a public relations communication tool. We then describe the concept of trust and source trustworthiness toward organizational communication and then outline the adaptation of a scale to measure the construct of source trustworthiness in the context of blogs and blogging. Next, we describe a study among online consumers to measure source trustworthiness by employing the amended scale. Certain aspects of the psychometric properties of the amended source trustworthiness scale are also addressed. Source trustworthiness is then analyzed against two blog usage constructs (the frequency of accessing blogs and the number of different blogs visited on average in a month) and a comparison was drawn across some basic demographic descriptors of the sample. This article concludes with the managerial implications, an acknowledgement of the limitations of this research, and further research avenues suggested by the results.

BLOGS IN PUBLIC RELATIONS

As blogging technology enables readers of blogs to contribute to public comments, it has a profound impact on the public relations function. While a substantial number of blogs are being used for purposes other than marketing, a small proportion are focused exclusively on the marketing of products and services (Marken, 2006).

Cho and Huh (2010) commented that while the proportion of all corporations that use blogs as a corporate communications tool is still small, the number is rapidly increasing. Companies are using ‘corporate blogs’ to enhance internal communications among their staff, as well as to improve public relations with external stakeholders.

In addition to corporate blogging, consumer bloggers maintain their own blogs that are focused on reviewing the products, services and technologies offered by corporations. Some of these bloggers are compensated by corporations or their agencies, while some are not. Corporate communication practitioners, public relations professionals and academics need to understand the advantages and disadvantages of using blogs in public relations.

Some authors, including Porter et al. (2007), stated that blogs are not yet considered as a standard public relations tool and Kent (2008) criticized that their utility as a public relations tool is currently limited. Kent (2008) argues that while many PR professionals are suggesting that blogs have tremendous potential as a tool for online communication and for reaching diverse publics, more scholarly research needs to be conducted before the majority of organisations will appreciate the importance of blogging. He commented that the blogging stampede should not trample PR professionals until scholars, researchers and especially PR professionals truly understand the effectiveness of blogging.

In an extensive overview, Kent (2008) describes the strengths and weaknesses of blogs as a public relations tool. He argues that blogs have several strengths, including their usefulness as a research tool as well as for message framing and persuasion. He believes blogs are particularly useful for research, issue monitoring, and environmental scanning.

The emergence of Web 2.0 offers new communication technologies in practice and brought both major challenges and major opportunities to public relations (Toledano, 2010). In this regard, blogs play an important
role in shaping PR 2.0. Blogs have been used as an important information distribution channel and as a knowledge-sharing tool (Droge et al., 2010). This communicative use of blogs in public relations enables PR professionals and marketing practitioners to use blogs as a market research tool to analyse the market and gauge public opinion on their business (Xifra and Huertas, 2008). It permitted new product development managers to share experiences about their products with the lead consumers and co-create value with them (Droge et al., 2010). On the other hand, due to the user generated content nature of blogs (Mutum and Wang, 2010), blogs have empowered consumers to contribute instant feedback by posting comments directly (Xifra and Huertas, 2008) and use blogs as a strong word-of-mouth communication channel (Droge et al., 2010; Riegner, 2007).

Corporate blogs, as well as consumers blogging about corporations, their products, services and technologies are multiplying at an unprecedented rate; however the utility of blogs is currently limited as a PR tool (Kent, 2008).

Although, blogs have incredible potential to be used as research and persuasion tools, there is still consumer skepticism toward this new form of marketing communications. Blogs cannot be taken to their full advantage unless we fully understand how to increase consumer trust and the level of source trustworthiness towards blogs.

**THE CONCEPT OF TRUST AND SOURCE TRUSTWORTHINESS**

Trust has been frequently stated in literature and the notion of trustworthiness is typically embedded in the concept of trust (Hardin, 2002). Larzelere and Huston (1980) stated that trust is most frequently defined as a belief by a person in the integrity of another individual, and the conceptualization of trust in the literature leads to the following definition: “trust exists to the extent that a person believes another person (or persons) to be benevolent and honest.”

Morgan and Hunt’s (1994) commitment-trust theory of relationship marketing conceptualize trust as existing when one party has confidence in an exchange partner’s reliability and integrity. The authors suggest that ‘confidence’ is built when the trusting party comes to a solid belief that the trustworthy party is ‘reliable’ and has ‘high integrity’, and that it is linked to qualities such as ‘consistent, competent, honest, fair, responsible, helpful, and benevolent’.

Morgan and Hunt (1994) argue that trust is a fundamental concept in relational exchanges as it has been a common topic in studies on social exchange. In an extent review, Bruner (2009) discusses that trust has been studied in various fields, including organizational behavior (Barney, 1990), communications (Hovland et al., 1953), services marketing (Berry and Parasuraman, 1991), strategic alliances (Sherman, 1992), retailing (Berry, 1993), buyer-seller bargaining situations (Schurr and Ozanne, 1985), and in studies conducted by the industrial marketing and purchasing group (Ford, 1990; Håkansson, 1982).

Thus, trust implies the reasons for which the relevant party is considered to be trustworthy (Hardin, 2002). Trustworthiness, on the other hand, can have diverse meanings from discretion, reliability, competence, integrity to empathy (Sheppard and Sherman, 1998). The meaning of trustworthiness is related to the assumption of the type of risk that people take at exchanging information. The risk refers to the possibility that the source of information does not accept moral responsibility or is unable to provide correct information. Hence, the information seeker needs to judge whether or not the source is sufficiently knowledgeable or skilful on one hand and on the other, whether they are honest and truthful (Hertzum et al., 2002).

**Trustworthiness** along with **expertise** constructs credibility (Hovland et al., 1953). The honesty of the source or motivation to offer valid information is referred to as source trustworthiness which, by itself, is a dimension of source credibility (Kelman and Hovland, 1953; McGuire, 1985). In other words source trustworthiness describes qualities such as being well-intentioned, truthful and unbiased (Tseng and Fogg, 1999). From a communication perspective, however, McGuire (1985) argues that when a spokesperson truly believes in the information they deliver, they build trustworthiness.

Accordingly, in advertising a product a loyal product user is the most reliable appeal candidate, since they most likely will recommend a product based on their own successful personal experience. A trustworthy product endorser tends to give testimonial evidence on behalf of a product and expresses their belief and opinion on the product’s value as a product user (McGuire, 1985). Untrustworthy sources, on the other hand, provoke challenges for information seekers (Priester and Petty, 1995). This is because in the absence of trust, information seekers are forced to judge the legitimacy of the source’s information (Tormala and Clarkson, 2008).

Blogs have the potential to present a human face to a company’s self-presentation and interaction with customers, which leads to building trust (Dwyer, 2007). Yang and Lim (2009) also found that blogger credibility plays a positive role in building relational trust. They proposed a theoretical model in explaining relational trust as a central outcome of effective blog-mediated public relations. Interestingly, Chesneya and Sub (2010) found no difference in perceived credibility when the bloggers are identifiable and when they are anonymous.

Kelleher (Kelleher and Miller, 2006; Kelleher, 2009) argued that conversational human voice communicates more effectively via organizational blogs than traditional
similar context, Schultz et al. (2011) found that the medium seems to be more important than the message. They described tweets, as a micro-blogging tool, had the most positive effect on secondary crisis communication. However, Yang et al. (2010) stated that in crisis situations source credibility seems to have minimal effects on post-crisis outcomes.

Source trustworthiness is a critical measure of the success of blogs in the communications toolbox of PR practitioners. The extent of source trustworthiness needs to be understood as well as the possible impact of consumer demographics on source trustworthiness. Literature suggests that the impact of demographics on perceived source trustworthiness of online reviews has been examined in two general venues: the impact of demographics of the source (blogger) on perceived source trustworthiness and the impact of the demographics of the receiver (blog reader) on perceived source trustworthiness. Most studies have examined the impact of demographics of the source (blogger) on perceived trustworthiness or credibility (Armstrong and Nelson, 2009; Flanagin and Metzger, 2003; Xie et al., 2011).

Armstrong and Nelson (2009) show that male authors were deemed more credible than female authors and Xie et al. (2011) confirm that the presence of personal identification, like name, state of residence and gender has a positive effect on the perceived credibility of online reviews. Other studies examined the impact of demographics of the receivers (blog readers) on their perceived source trustworthiness or credibility (Johnson and Kaye, 2004; Johnson et al., 2008; Kim, 2006). Johnson et al. (2008) suggest men consistently judge blogs as more credible than women do, however studies by Kim (2006) and Johnson and Kaye (2004) show that demographics cannot strongly predict credibility of blogging.

**Adaptation of a scale to measure source trustworthiness of blogs**

The conceptualization of source trustworthiness was primarily formed during 1940s and 1960s by researchers attempting to discover the dimensions of source credibility (Hovland et al., 1953; Markham, 1969). Researchers realized that trustworthiness of the source is an important latent construct in measuring persuasion.

To accurately assess the level of trustworthiness, a multi-item scale is preferred over a single item Likert scale or even a semantic differential scale such as trustworthy versus untrustworthy (Ohanian, 1990). Therefore, since 1970s with the concerns of the newspaper industry about people switching to radio and television for receiving the news (Johnson and Kaye, 2004), more researches were conducted in order to find source trustworthiness dimensions by using explorative factor analysis techniques. Table 1 provides an overview of commonly used items in trustworthiness scales in the marketing context with a Cronbach’s alpha ($\alpha$) greater than 0.8 (Bruner, 2009).

A recommended source trustworthiness scale would be composed of various semantic differentials measuring a component of source credibility relating primarily to honesty and sincerity (Bruner, 2009). Several applications of such trustworthiness scales have been made in different contexts such as the trustworthiness of a company (MacKenzie and Lutz, 1989); trustworthiness of non-celebrity product endorsers (Moore et al., 1994); and credibility of celebrity endorsers (Ohanian, 1990, 1991; Till and Busler, 2000; Tripp et al., 1994).

Literature shows that the dimensions of source trustworthiness as a concept vary among different studies depending on the kind of media on which each research has focused (Rieh and Danielson, 2007). For example, for years ‘dynamism’ was acknowledged as a major dimension of credibility, however when the focus of source credibility studies was shifted from spokespersons credibility to the print news credibility, the role of dynamism diminished (Rieh and Danielson, 2007). Therefore it is necessary to validate the scales that were designed for measuring the traditional concept of source trustworthiness before using them into another context. For this reason, this paper validates the adaptation of source trustworthiness scale to measure the construct of source trustworthiness in the context of blogs.

Ohanian (1990, 1991) is regarded as the primary source for most of the source trustworthiness studies as acknowledged by Bruner (2009). Ohanian (1990) developed a scale for measuring celebrity endorsers’ perceived expertise, trustworthiness and attractiveness. After several exploratory and confirmatory analyses to refine the scales, she used five semantic items to measure trustworthiness: Dependable / Undependable, Honest / Dishonest, Reliable / Unreliable, Sincere / Insincere, Trustworthy / Untrustworthy. Ohanian (1990) initially employed eight items to measure the trustworthiness dimension, but subsequently deleted the three items with the lowest item-to-total correlations namely fair, truthful and ethical.

In a similar context, Tripp et al. (1994) examined celebrities as endorsers and specifically the effects of multiple product endorsements by a single spokesperson. The authors based their items on work by McCroskyc (1966) but refined and validated a 7-item, 7-point semantic differential scale to measure the subject’s perception of celebrity trustworthiness. The items in the Trip et al. (1994) scale were: Insubordinate / Sincere, Dishonest / Honest, Not trustworthy / Trustworthy, Not credible / Credible, Not biased / Biased, Not believable
Table 1. Commonly used items in trustworthiness scales based on the marketing scale inventory by Bruner (2009).

<table>
<thead>
<tr>
<th>Reference</th>
<th>Cronbach’s α</th>
<th>Sincere</th>
<th>Honest</th>
<th>Dependable</th>
<th>Trustworthy</th>
<th>Credible</th>
<th>Biased</th>
<th>Believable</th>
<th>Reputable</th>
<th>Reliable</th>
<th>Truthful</th>
<th>Convincing</th>
<th>Expert</th>
<th>True</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrews et al. (2000)</td>
<td>0.89</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Andrews et al. (1998)</td>
<td>0.89</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Bobinski et al. (1996)</td>
<td>0.91</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Bower and Landreth (2001)</td>
<td>0.93</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
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<tr>
<td>Goldsmith et al. (2001)</td>
<td>0.85</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>Kozup et al. (2003)</td>
<td>0.93</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
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<tr>
<td>MacKenzie and Lutz (1989)</td>
<td>0.82</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>Moore et al. (1994)</td>
<td>0.80</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td></td>
<td>✓</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Ohanian (1990)</td>
<td>0.89</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td></td>
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</tr>
<tr>
<td>Putrevu (2004)</td>
<td>0.93</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sengupta and Johar (2002)</td>
<td>0.86</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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</tr>
<tr>
<td>Shamasani et al. (2001)</td>
<td>0.94</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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</tr>
<tr>
<td>Stafford et al. (2002)</td>
<td>0.91</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Till and Busler (2000)</td>
<td>0.95</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Tripp et al. (1994)</td>
<td>0.88</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
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<td></td>
</tr>
</tbody>
</table>

/ Believable, and Disreputable / Reputable.

In our research the scales developed by Ohanian (1990) and Tripp et al. (1994) were combined, adapted and applied to the blogging context. Therefore, to measure the source trustworthiness of blogs, we employed a 9-item, 7-point semantic differential scale. The adjectives were: Insincere / Sincere, Dishonest / Honest, Not dependable / Dependable, Not trustworthy / Trustworthy, Not credible / Credible, Not biased / Biased, Not believable / Believable, Disreputable / Reputable, Unreliable / Reliable.

**RESEARCH METHODOLOGY**

In this section, we first address the sample design as well as the data collection, followed by a discussion of the survey instrument and the measurement scales employed. Data collection was conducted in Australia by a large provider of pre-recruited, managed, online consumer panels. According to Australian Bureau of Statistics (2011), 79% of Australian households have access to the internet (92% broadband) and most households (77%) are using it every day. The highest proportion of individuals accessing the internet is the persons aged 18 to 24 years (96%) and 85% of them use online social networking sites. However, more than 70% of people above 55 years do not use networking sites.

Based on Australian Bureau of Statistics (2011), in populations with higher education levels, the proportion of the population accessing the internet is higher. Thus, a non-probabilistic sample of respondents was selected by using a quota sample applied to the demographic characteristics of age and gender, thus ensuring that our sample would roughly represent the Australian national adult online population. The specific target for this survey was defined as Internet users between the ages of 18 and 49. A total of 400 panel members were invited via email and 169 completed the survey by the cut-off date, providing us with an effective response rate of 42.25%. All 169 completed surveys (100%) were usable and therefore were included in the analysis. The participants were incentivised upon completion of the short survey by a small number of member-points which could accumulate over time, to be redeemed later for various prizes.

The aim of this survey was to study the attitudes of Internet users towards ‘blogs’, which were explicitly described to respondents as ‘online blogs that review or discuss products, services, and technologies, and generally do not attempt to sell anything, and are written by consumers and not by the companies who produce the products, services or technologies they write about.’

The survey instrument consisted mainly of the following five sections:

1. A 9-item scale adopted from Ohanian (1990) and Tripp et al. (1994) to measure trustworthiness (Table 3). All items were scored on a 7-point semantic differential scale.
2. According to the vast use of ‘truthful’ as an adjective of ‘source trustworthiness’ in the literature (Ohanian, 1990; Moore et al., 1994; Tseng and Fogg, 1999; Goldsmith et al., 2001), we have included this item as the criterion validator. This overall single-item scale measured respondents’ overall perceptions regarding the truthfulness of blogs (a 4-point Likert-type scale anchored on 1 = Very...
Table 2. Respondents: Basic demographics.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>52.7</td>
</tr>
<tr>
<td>Female</td>
<td>47.3</td>
</tr>
<tr>
<td>18 – 29 years</td>
<td>30.8</td>
</tr>
<tr>
<td>30 – 39 years</td>
<td>34.3</td>
</tr>
<tr>
<td>40 – 49 years</td>
<td>34.9</td>
</tr>
<tr>
<td>High school not completed</td>
<td>16.6</td>
</tr>
<tr>
<td>High School completed</td>
<td>18.3</td>
</tr>
<tr>
<td>Beyond high school</td>
<td>65.1</td>
</tr>
</tbody>
</table>

Table 3. Source trustworthiness of blogs scale descriptive statistics of 7-point semantic differential scale.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Factor loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Insincere / sincere</td>
<td>4.57</td>
<td>1.13</td>
<td>0.827</td>
</tr>
<tr>
<td>2</td>
<td>Dishonest / honest</td>
<td>4.52</td>
<td>1.06</td>
<td>0.795</td>
</tr>
<tr>
<td>3</td>
<td>Not dependable / dependable</td>
<td>4.36</td>
<td>1.16</td>
<td>0.838</td>
</tr>
<tr>
<td>4</td>
<td>Not trustworthy / trustworthy</td>
<td>4.44</td>
<td>1.19</td>
<td>0.886</td>
</tr>
<tr>
<td>5</td>
<td>Not credible / credible</td>
<td>4.37</td>
<td>1.24</td>
<td>0.862</td>
</tr>
<tr>
<td>6</td>
<td>Not biased / biased</td>
<td>3.65</td>
<td>1.32</td>
<td>n/a</td>
</tr>
<tr>
<td>7</td>
<td>Not believable / believable</td>
<td>4.47</td>
<td>1.19</td>
<td>0.870</td>
</tr>
<tr>
<td>8</td>
<td>Disreputable / reputable</td>
<td>4.42</td>
<td>1.05</td>
<td>0.742</td>
</tr>
<tr>
<td>9</td>
<td>Unreliable / reliable</td>
<td>4.36</td>
<td>1.19</td>
<td>0.884</td>
</tr>
</tbody>
</table>

1. Cronbach's Alpha: 0.95 with item 6 (Not biased / Biased) removed from the scale.

untruthful, through 4 = Very truthful).
3. A single-item 6-point Likert type scale capturing how frequently respondents read online blogs that review products, services, and technologies, anchored on ‘1 – never’ through ‘6 – very frequently’.
4. An open-ended question asking respondents to indicate the number of different blogs that they access on average in a month.
5. Demographic variables including gender, age and highest level of education attained.

RESULTS AND DISCUSSION

A number of 169 online consumers participated in the study (52.7% were male). Table 2 shows the key demographics of the respondents. The means and standard deviations of the responses to the 9-item source trustworthiness scale items are shown in Table 3. Principal component factor analysis was performed on the 9-item in order to assess the dimensionality of the items as a single construct. This led to the extraction of two factors explaining a total of 77.32% of the variance.

All the items with the exception of item 6 (Not biased / biased) loaded strongly onto the first factor. Item 6 loaded strongly onto the single-item second factor which may be a result of the misinterpretation of the reversed scale. Not biased / biased is the only reversed phrased item in the original Tripp et al. (1994) source trustworthiness scale, and were accordingly reverse scored in our analysis.

By eliminating item 6 in the next analysis, a single factor emerged which explained 74.06% of the variance. Both the Cronbach’s alpha and a principal components factor analysis suggested this item to be unstable as respondents probably misinterpreted the direction of this scale item, and consequently this item was removed without significantly compromising the scale integrity. The Cronbach’s alpha computed for the reduced 8-item scale was 0.95 (by comparison, Tripp et al. (1994) reported reliability coefficients exceeding 0.88). This indicates that the scale possesses high internal consistency.

We therefore concluded that source trustworthiness in this context is a uni-dimensional construct, and that the scores on the eight remaining items could be summed to produce an overall source trustworthiness score. In this case, a low score would indicate a low source trustworthiness of blogs. A high score on the other hand, would imply high source trustworthiness.

To assess the validity of the scale, two tests were performed. The means on the summed source trustworthiness scale were tabulated against the overall evaluation of blogging’s truthfulness, as provided by the respondents on a 4-point scale. This single-item scale measured the response to the following statement: ‘Taking into account everything you know or have heard of about
online blogs that review products, services, and technologies, please indicate whether you feel these blogs are generally truthful, or untruthful.' The results are indicated in Table 4.

The convergent validity of the scale was first assessed as is shown in Table 4, by means of a regression procedure, with the mean source trustworthiness score as the predictor variable and perceptions of truthfulness of blogs as the criterion. A high correlation between the construct being studied and an independent but conceptually related construct, is usually taken as evidence of convergent validity (cf. Carman, 1990; Pitt et al., 1995). In the regression conducted, the resulting $R^2$ was highly significant ($R^2 = 0.34$, $F(1,167) = 85.38$, $p < 0.001$), which means that an individual's score on the source trustworthiness scale is also highly correlated with their overall assessment of blogging's truthfulness as a related, but independent, construct.

Confirmatory factor analysis (CFA) was used as a further assessment of construct validity of the trustworthiness scale. Structural equation modeling (SEM) with AMOS 7 was used to perform one factor model CFA, where the trustworthiness latent variable values were manifested by eight observed variables. The $x^2$ test yields a value of 55.39, which was evaluated with 20 degrees of freedom, has a corresponding $p$-value < .001. Thus, the $x^2/df$ is < 5, while the root mean square error of approximation (RMSEA = 0.10), root mean residual (RMR = 0.03), adjusted goodness of fit index (AGFI = 0.86), comparative fit index (CFI = 0.97), normed fit index (NFI = 0.95) and goodness of fit index (GFI = 0.92) figures suggest that the model fits the data reasonably well. We acknowledge that a value of about 0.08 or less for the RMSEA would indicate a reasonable error of approximation, however in line with Browne and Cudeck (1993) we would not want to employ a model with a RMSEA greater than 1 (Browne and Cudeck, 1993: 144). Thus, the model just fits the data. The average variance extracted (AVE) resulted in a value of 0.706 and the composite reliability (CR) was computed as 0.930. As shown in Table 3, all factor loadings exceed 0.7 ($p < .000$), as an indication of convergent validity.

Content validity determines how inclusive a scale is for the range of meanings of a given concept (Babbie, 1992). Some authors (Carman, 1990; Pitt et al., 1995) believe that a visual assessment of the simple linear tabulation between a construct and another independent, though conceptually related construct, can be a concrete indication of content validity.

Our results demonstrate that the participants who score blogs higher on source trustworthiness, also state that blogs are more truthful. However those who score blogs lower on source trustworthiness believe them to be either untruthful or very untruthful. This serves as a good indicator of content validity.

The overall source trustworthiness (the means on the summed source trustworthiness scale) as the dependent variable, and the demographic descriptors as predictors were computed in a one-way analysis of variance (ANOVA), which is presented in Table 5.

The following observations can be made from Table 5. First, overall source trustworthiness seems totally unrelated to gender, as there are no statistical significant differences ($F(1,167) = 0.017$, $p = 0.895$) between males and females. Second, age seems somewhat related to source trustworthiness ($F(2,167) = 4.380$, $p = 0.014$). The Tukey-Kramer HSD post-hoc comparisons of the three age groups suggests that the 18- to 29-year age group assigns a significantly higher source trustworthiness to blogs (Mean = 4.74) than the 40-49 year age

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of squares</th>
<th>Mean square</th>
<th>F Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1</td>
<td>20.013</td>
<td>20.013</td>
<td>85.376</td>
</tr>
<tr>
<td>Error</td>
<td>167</td>
<td>39.147</td>
<td>0.234</td>
<td></td>
</tr>
<tr>
<td>C. Total</td>
<td>168</td>
<td>59.160</td>
<td></td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>

Table 4. Source trustworthiness scale validity.

<table>
<thead>
<tr>
<th>Response</th>
<th>Very untruthful</th>
<th>Untruthful</th>
<th>Truthful</th>
<th>Very truthful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of respondents</td>
<td>8</td>
<td>26</td>
<td>127</td>
<td>8</td>
</tr>
<tr>
<td>Mean trustworthiness</td>
<td>3.03</td>
<td>3.41</td>
<td>4.67</td>
<td>5.48</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of observation</th>
<th>Overall truthfulness mean</th>
<th>Std. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>169</td>
<td>2.80</td>
<td>0.593</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analysis of variance (ANOVA)</th>
<th>R square</th>
<th>Adjusted R square</th>
<th>Std. Error of the estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>df</td>
<td>Sum of squares</td>
<td>Mean square</td>
</tr>
<tr>
<td>Model</td>
<td>1</td>
<td>20.013</td>
<td>20.013</td>
</tr>
<tr>
<td>Error</td>
<td>167</td>
<td>39.147</td>
<td>0.234</td>
</tr>
<tr>
<td>C. Total</td>
<td>168</td>
<td>59.160</td>
<td></td>
</tr>
</tbody>
</table>
Table 5. Summary of ANOVA procedures: Demographics as predictor, and source trustworthiness as criterion variables.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number</th>
<th>Mean</th>
<th>Std. D.</th>
<th>F Ratio</th>
<th>Prob &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>80</td>
<td>4.45</td>
<td>1.12</td>
<td>0.017</td>
<td>0.895</td>
</tr>
<tr>
<td>Male</td>
<td>89</td>
<td>4.43</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Number</th>
<th>Mean</th>
<th>Std. D.</th>
<th>F Ratio</th>
<th>Prob &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-29</td>
<td>52</td>
<td>4.74</td>
<td>0.86</td>
<td>4.380</td>
<td>0.014</td>
</tr>
<tr>
<td>30-39</td>
<td>58</td>
<td>4.42</td>
<td>1.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td>59</td>
<td>4.19</td>
<td>1.02</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>Number</th>
<th>Mean</th>
<th>Std. D.</th>
<th>F Ratio</th>
<th>Prob &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; High school</td>
<td>28</td>
<td>4.30</td>
<td>1.09</td>
<td>1.269</td>
<td>0.284</td>
</tr>
<tr>
<td>High school</td>
<td>31</td>
<td>4.25</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; High school</td>
<td>110</td>
<td>4.53</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Summary of regression– Blog frequency and number of blogs accessed as predictor, and source trustworthiness as criterion variables.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>R²</th>
<th>F Ratio</th>
<th>β</th>
<th>t</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blog frequency</td>
<td>3.92</td>
<td>1.48</td>
<td>0.196</td>
<td>40.636</td>
<td>0.442</td>
<td>6.375</td>
<td>0.001</td>
</tr>
<tr>
<td>Number of blogs accessed</td>
<td>7.42</td>
<td>12.29</td>
<td>0.043</td>
<td>7.510</td>
<td>0.207</td>
<td>2.740</td>
<td>0.007</td>
</tr>
</tbody>
</table>

group (Mean = 4.19). Third, source trustworthiness does not seem to be significantly related to education ($F(2,167) = 1.269, p = 0.284$) among the three levels of education.

To understand the impact of additional variables on source trustworthiness, we investigated the frequency with which respondents accessed blogs, as well as the number of different blogs they accessed over a specified period by conducting two separate regressions. Blog reading frequency was measured by asking respondents how frequently they read online blogs that review products, services and technologies. This was scored on a 6-point scale anchored on 1 = never, through 6 = very frequently (Mean = 3.92; S.D. = 1.48).

An open-ended question probed respondents on the number of different blogs that they access on average in a month. Table 6 shows the means and standard deviations on these two items, as well as a summary of their regressions on the source trustworthiness measurement. It is evident that there are significant (albeit not very strong) relationships between both the frequency with which respondents access blogs and source trustworthiness ($R^2 = .20, F(1,167) = 40.64, p<0.0001$), as well as the number of blogs respondents’ access together with their views on source trustworthiness ($R^2 = .043, F(1,167) = 7.51, p<0.007$).

In order to check whether age is a significant predictor of source trustworthiness when controlling for additional variables such as number of access blogs and blogs frequency, a one-way analysis of covariance (ANCOVA) was conducted. Age was considered as the independent variable with three categories (18 to 29, 30 to 39 and 40 to 49), the source trustworthiness was taken as the dependent variable and the number of different blogs accessed and blog frequency was put as the covariates.

A preliminary analysis evaluating the homogeneity of regression assumption indicated that the relationship between the covariates and the dependent variable did not differ significantly as a function of the independent variable, $F(2, 166) = 1.79, p = .169$. The ANCOVA was not significant, $F(2, 164) = 1.05, p = .349$, indicating age is not a significant main effect (Table 7).

Conclusion

The Ohanian (1990) and Tripp et al. (1994) scales were combined and adapted to measure Australian respondents’ source trustworthiness toward blogs that review or discuss products, services and technologies. Applied in this new media context, this scale exhibits internal consistency as well as evidence of both content and convergent validity.

Factor analysis suggests that the construct in this instance is uni-dimensional, so that scores on the reduced eight items comprising the scale may be summed to provide an overall indication of an individual’s perceptions of source trustworthiness of blogs. While source trustworthiness does not seem to be related to either gender or level of education, there appears to be some relation to age. The younger respondents exhibited...
Table 7. Analysis of co-variance for source trustworthiness by age.

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of blogs accessed</td>
<td>0.055</td>
<td>1</td>
<td>0.055</td>
<td>0.069</td>
<td>0.793</td>
</tr>
<tr>
<td>Blog frequency</td>
<td>20.688</td>
<td>1</td>
<td>20.688</td>
<td>25.822</td>
<td>0.000</td>
</tr>
<tr>
<td>Age</td>
<td>1.697</td>
<td>2</td>
<td>0.849</td>
<td>1.059</td>
<td>0.349</td>
</tr>
<tr>
<td>Error</td>
<td>131.393</td>
<td>164</td>
<td>0.801</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3496.188</td>
<td>169</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent variable: Source trustworthiness.

higher levels of source trustworthiness while the oldest group scored significantly lower.

Thus, unlike Johnson et al. (2008) that suggest men perceive blogs more credible than women, the results of this study propose that demographics are not a strong predictor of source trustworthiness in the blogging context, supporting past researches such as Johnson and Kaye (2004), Kim (2006) and a more recent study by Ghazisaeedi (2012), stating that the influence of demographics on blog credibility diminished when blog readers become more demographically mainstream.

Furthermore, there is a positive and significant relationship between source trustworthiness and both the frequency with which respondents access blogs and the number of blogs accessed. Consequently, the results of this research confirms past studies suggesting that heavy blog readers rated blogs more credible than light blog users (Greer, 2003; Johnson et al., 2008; Johnson and Kaye, 2010).

MANAGERIAL IMPLICATIONS

The results of this study contain a number of implications for marketing and communication managers, as well as for PR professionals. The source trustworthiness scale was adapted from two other scales used in measuring celebrity endorsers’ perceived trustworthiness. The purpose of this study was to validate a scale to measure source trustworthiness of blogs that review products, services and technologies. This scale seems to possess robust psychometric properties and in general it can be used as a measurement tool to gauge trustworthiness towards blogs.

PR professionals can progress beyond the scope of this study and employ this scale to gauge consumer perception of the source trustworthiness of blogs in certain market segments, for specific products, services or technologies, or evaluate the level of source trustworthiness within other demographic groups or across diverse cultures. In addition to employing this scale across different target markets, it could also be used to assess source trustworthiness of various types of blogs or specific blog writers.

The results of this study suggest that blogs are a more appropriate PR tool when companies are targeting younger segments. If the target market is older people, it may be more effective to use traditional communication channels, such as product reviews in print media such as newspapers and magazines, rather than product review blogs.

LIMITATIONS

This study has a number of limitations, the recognition of which should help refine future research efforts. The source trustworthiness scale was adapted from traditional media to an online blogging context. Although this scale seems to retain solid psychometric properties, there are some concerns that elements of trustworthiness exclusively related to blogs, blogging and public relations may not have been accounted for.

The Tripp et al. (1994) scale consists of seven items, of which one item (Not biased / Biased) was phrased in the opposite direction to the other six items. Our research found this item to be unstable as some respondents most likely misinterpreted the statement or mis-recorded their answer. While removal of this item from our analysis improved the psychometric properties, the original scale intended its inclusion. Researchers using this scale in the future would certainly benefit by having all items unidirectional.

There is still doubt whether the results of this study can be generalized to a broader international context and a broader age range, as our participants were limited to Australians aged 18 to 49.

This study specifically focuses on blog readers’ views on source trustworthiness of blogs. The opinions of blog writers, public relation managers, marketing communication specialists, and other stakeholders were excluded.

Although this study permits limited generalization, unlike experimental studies, it cannot explain the exact circumstances and causes. While the source trustworthiness of product review blogs among a sample of online consumers has been demonstrated, it is hard to identify its causes or to predict its outcomes under different conditions. For example, while the results confirm that younger consumers generally perceive higher
levels of source trustworthiness, a qualitative approach is required to obtain richness and depth of insight.

While the results suggest that accessing blogs frequently and accessing a larger number of blogs may cause one to have higher source trustworthiness, the inverse direction of causality can also be true. Likewise it is possible that a higher level of source trustworthiness causes consumers to access a larger number of blogs more often.

Supposing the purpose of this study was to link source trustworthiness to any other well-defined multi-item constructs, the role of source trustworthiness would have been demonstrated in a broader context of behaviors.

**FUTURE RESEARCH DIRECTIONS**

Based on the results of this study, there are a number of avenues that can be pursued for further research. The source trustworthiness scale was adopted from two other measures used in a different context. It would be worthwhile to ensure that this scale accounts for all critical elements of trustworthiness. A qualitative study among blog readers and non-blog readers is recommended for a better understanding of trustworthiness in the blogging context.

One specific adaption for future use of this scale would be to phrase all scale items in a unidirectional manner (that is, all positive words to the left side of the semantic differential scale) to avoid confusion or mis-recording of answers by respondents.

This study has been done among Australian online consumers. It would be valuable to extend this study into a longitudinal investigation to track consumer perception on source trustworthiness towards blogs over time. Likewise, it would be interesting to expand this study to other countries and cultures.

Finally, as mentioned in limitations, this study has not attempted to link source trustworthiness to any other constructs. It would also be useful to examine the relationship between source trustworthiness and personal characteristics such as cynicism and personal self-esteem.

**ACKNOWLEDGEMENT**

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**REFERENCES**


A new model for novel queuing location problem: Meta heuristic solution

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The maximal covering location problem (MCLP) maximizes the population that has a facility within a maximum travel distance or time. Numerous extensions have been proposed to enhance its applicability, like the probabilistic model for the maximum covering location-allocation with constraint in waiting time or queue length for congested systems, with one or more servers per service center. In this paper, a novel queuing location problem that can be determined as MCLP is developed and then for solving this problem, new meta-heuristic algorithms like simulated annealing and genetic algorithm is proposed. The results of these algorithms and the amount of their run time are compared.

Key words: Set covering, location, maximal covering location problem, queuing.

INTRODUCTION

The field of set covering is a practical concept with a vast usage in Air port hubs (O’Kelly, 1987), Blood bank (Price and Turcotte, 1986), Emergency Medical Services (ReVelle et al., 1977), fast food restaurants (Min, 1987), Fire stations (Schilling et al., 1980), Telecommunication switching centers (Hakimi, 1965; Yaman, 2004), Location of bank accounts (Cornuejols et al., 1977), vehicle routing (Bramel and Simchi, 1995), and a lot of more usage was found for this problem.

Much research has been carried out on location problem, in which it is required to minimize total travel time, physical distance, or some other travel related "Cost", and it is often assumed that facilities are sufficiently large to meet any demand likely to be encountered (Boffey et al., 2007). Location of service facilities and allocation of service calls to servers, dramatically are being affected by the congestion of the demand. All of the models are designed based on the providing the highest level of the service and achieving the lowest level of congestion possible.

Current et al. (2002) introduced eight basic facility location models, which are set covering, maximal covering, p-center, p-dispersion, p-median, fixed charged, hub and maximum. In all of them, the general problem is to locate new facilities to optimize distance or some measures more or less functionally related to distance (for example, travel time or cost, demand satisfaction). The first four are based on maximum distance and the second four are based on total (or average) distance.

Set covering location problem: The set covering problem was introduced as the first location covering problem by Toregas (1971). The objective of that is to locate the minimum number of facilities required to "cover" all of the demand nodes.

Maximal covering location problem: The maximal covering location problem (MCLP) (Church and ReVelle, 1974) is to locate a predetermined number of facilities, ρ, to maximize the demand that is covered. Thus, the MCLP assumes that there may not be enough facilities to cover all of the demand nodes.

p-center problem: The p-center problem (Hakimi, 1964, 1965) addresses the problem of minimizing the maximum distance that demand is from its closest facility given that we are sitting a pre-determined number of facilities.

p-dispersion: The p-dispersion problem (pDP) differs from the problems in two ways (Kuby, 1987). First, it is concerned only with the distance between new facilities.
Second, the objective is to maximize the minimum distance between any pair of facilities.

**p-median:** The p-median model (Hakimi, 1965, 1964; Belotti, 2007; Ceselli, 2003) finds to locate of p facilities to minimize the demand weighted total distance between demand nodes and the facilities to which they are assigned.

**Fixed charge location problem:** The objective of fixed charge location problem (FCLP) is to minimize total facility and transport costs; it determines the optimal number and location of facilities, as well as the assignments of demand to a facility.

**Hub location problems:** Numerous models (O’Kelly, 1986a, b; Campbell, 1990, 1994)) have been formulated to locate the hubs and delivery routes of hub systems. Most of these models attempts to minimize total cost (as a function of distance).

**The maximus location problem:** The maximus location problem seeks the locations of p facilities such that the total demand-weighted distance between demand nodes and the facilities to which they are assigned is maximized.

As far as the model is in maximal covering models category a brief review of these models will be beneficial. The location set covering problem (LSCP) as a version of set covering problem was introduced by Toregas et al. (1971). The next step in this field is introducing maximal covering location problem (MCLP) by Church and ReVelle (1974). The idea of Server congestion was first considered by Larson. Before 1983, all models that are introduced are not probabilistic models, but Daskin (1983) built the structure of probabilistic models with MEXCLP that is probabilistic version of MCLP. Later, Berman et al. (1985, 1986, 1987) developed some models using queuing theory for congested networks. Then Marianov et al. (1994, 1996, 1998) proposed several models in which the number of requests for service was stochastic process.

Real situations very often have demand for their services which is both variable and random in nature. Then, although the facility may be able to cope with average demand, there will be times of heavy demand when it will not cope; such a facility will be said to be congested.

For congested systems, a facility will not be able to cope at times of heavy demand. When this is the case, it will possible for users to wait until the facility is free to serve them whereas in some other cases such as, for example maternity homes, it is not feasible to wait. When waiting is not permitted (or only limited waiting is allowed) then a user is lost to fully occupied facility. A natural objective to minimize in this case will thus be the total amount of demand lost to the system (Boffey et al., 2007). The conditions based on the knowledge for the users resulted in formulated the congested location problem as follows: First, when users have very little knowledge of queue characteristics. Secondly, when users have estimates of mean queue length for all facilities. Thirdly, when users have knowledge of current state of relevant queues.

A location problem involves users traveling to a facility for service, or server traveling for facilities to the users (Boffey et al., 2007). We will consider immobile (fixed) servers in this paper. In the competitive market that some active factories are produced, similar products and a new factory want to be established. There are two different kinds of nodes available in that environment as follows: First, the nodes that are possible to establish a service centers on them because there is not any service center around them and some demands are lost-sales. Second, the nodes that is not possible to establish centers, because there is not any free demand on them. In the feasibility study phase, factory must decide which node must be choose and in each nodes how many service centers must be established, the model is defined for replying to this question.

In this paper, a network of several nodes will be considered. Each node that could be considered as a customer has demand for service. The demand follows a time homogeneous Poisson process. Servers can be located at nodes of the network as follows: one server at a node, more than one server at a node, and no server at a node. The service distribution is also Poisson and a maximum probability is considered for each server's occupancy. Each customer selects the servers based on the Logit function and the objective is to maximize the covering. A novel maximal covering location problem will be proposed and genetic and simulated annealing algorithm will be compared in this model to find out which of them are more suitable for solving the model in this paper.

The rest of the paper is organized as follows. Subsequently, notation and problem formulation is given. Solution algorithms including genetic algorithm and simulated annealing algorithm are then proposed. Some numerical problems are solved based on the algorithms and the results are addressed. Finally, the conclusions and further research is considered.

**NOTATION AND PROBLEM FORMULATION**

**Model notations**

The notation is as follows:

- \( n \): Network nodes (customers).
- \( M \): Number of service centers.
- \( N \): The set of candidate location for building service centers.
N': the sets of locations occupied by the incumbent service centers.

\( \phi_i \): Demand rate for the \( i \)th node \((i=1, 2, 3, \ldots, n)\).

\( \mu_j \): Service rate of the service center \( j \) that is exponential distributed.

\( d_{ij} \): Distance between nodes \( i \) and \( j \).

\( p_{ij} \): The recourse probability of the \( i \)th node demand to service center at the node \( j \).

\( \alpha \): Reliability level of service quality constraint.

\( \rho_j \): The occupancy probability (occupancy coefficient) of the service center at the \( j \)th node.

\( y_j \) is the model decision variable and is represent the number of servers that are located at node \( j \).

The study assumes customer on the node can receive service from different service centers, too. There is not any obligatory assumption. The cost will use to calculate the probability of choosing a service center by a demand point that is calculated based on the Logit function that is proposed by McFadden (1974) and used by Marianov et al. (2008). In their model, they considered the probability of the demands on the service centers with Logit function by using wait time for having service and travel time for transferring from demand points to service centers. The objective function of their model was building or not building some limited service centers in an area. This in not seemed to be realistic, so we assumed in our model that building of service centers depend on the capacity of the area and the objective function will be the number of service centers that will be built on a demand area. We will use the Logit function for referring demands to service centers.

The percentage of customer capture by each facility will be given by Logit functions of the cost (McFadden, 1974). Hence, the probability \( P_j \) of a user at node \( i \) choosing to go to the facility at node \( j \), is defined by the expression:

\[
P_j = \frac{Y_i e^{-\gamma \phi_i}}{\sum_{k \in N} Y_k e^{-\gamma \phi_k} + \sum_{k \in N} e^{-\gamma \phi_k}} \quad \forall i \in N, j \in N \cup N' \tag{1}
\]

\( \gamma = \pi / 6\sqrt{\sigma} \) where \( \sigma \) is the standard deviation in “taste” of the consumers. If \( \gamma \) is large, all consumers at a demand node will always patronize the same facility. As \( \gamma \) decreases, the dispersion in facility choice increases, that is, the consumers at the demand node \( i \) will not always choose the same facility \( j \) but they will use possibly all facilities, each one with a probability \( P_k \). Customers rank the open facilities by distance (travel and waiting times), and the higher the destination, the smaller the probability \( P_j \) of patronizing that particular facility. The probability \( P_j \) is necessarily equal to zero if there is no open facility at node \( j \). \( d_{ij} \) is the distance, as perceived by a customer at demand node \( i \), of patronizing a facility located at node \( j \).

**Model constraints**

As far as our model is a kind of MCLP model, following constraint as a common constraint will be used. Our limitation in budget will result to limitation in building service centers as follows:

\[
\sum_{j=1}^{n} Y_j = M \quad , \quad Y_j = 0, 1, 2, \ldots, M \tag{2}
\]

As far as in the situations that \( y_j = 0 \), the recourse probability of the \( i \)th node demand to service center at the node \( j \) will be exactly equal to zero as well as the maximum amount of \( P_j = 1 \), so the following Formula will be resulted:

\[
p_{ij} \leq Y_j \quad \forall i, j \in N \tag{3}
\]

Then the demand rate to each service center \( \bar{\phi}_j \) will be as follows:

\[
\bar{\phi}_j = \sum_{i \in N} \phi_i p_{ij} \quad \forall j \in N \cup N' \tag{4}
\]

\( \rho_j \) the occupancy probability (occupancy coefficient) of the service center at the \( j \)th node will be calculated as follows:

\[
\rho_j = \frac{\bar{\phi}_j}{Y_j \mu_j} \tag{5}
\]

The constraint of quality of service related to \( \alpha \) (Probability of joining the queue line when the service center is occupied) this constraint will guarantee that with the probability of \( \alpha \) the length of the queue in each service center will not be more than a \( b \) (is an arbitrarily value).

\[
p \text{ (Service center } j \text{ has maximum } b \text{ demand in the queue) } \geq \alpha \tag{6}
\]

The compliment of formula 5 will be as follows:

\[
p \text{ (Service center } j \text{ has minimum } b \text{ demand in the queue) } \leq 1 - \alpha \tag{7}
\]
\[ p \text{ (Service center } j \text{ has minimum } b \text{ demand in the queue) is equal to } p \text{ (system has at least } b + Y_j \text{ customers).} \]

Furthermore, in a system \( M/M/c/K \) that the rate of entrance of customers is \( \lambda \) and the service rate in each center is \( \mu \) we will have probability of being no customer in the \( j \)th node as follows:

\[
\pi_j = \frac{\Phi_j^n \times 1}{Y_j!} \times \frac{1}{1 - \rho_j} \quad \forall j \in N \cup N'
\]

\[ \pi_n \text{ the probability of being } n \text{ customers in the system is as follows:} \]

\[
\pi_n = \frac{\tilde{\phi}_n}{Y_j! \mu^n (Y_j - n - b)^n} \pi_j^n
\]

Then it can be concluded that:

\[ p \text{ (System has at least } b + Y_j \text{ customers) =} \]

\[
\sum_{n=b+Y_j+1}^{\infty} \pi_n = \sum_{n=b+Y_j+1}^{\infty} \frac{\tilde{\phi}_n}{Y_j! \mu^n (Y_j - n - b)^n} \pi_j^n
\]

With using Formula 9 in Formula 8 will result Formula 10 as follows:

\[ p \text{ (System has at least } b + Y_j \text{ customers) =} \]

\[
\frac{\pi_j^n \times 1}{Y_j!} \times \frac{1}{1 - \rho_j} \times \sum_{n=b+Y_j+1}^{\infty} \rho_j^n \times \frac{\tilde{\phi}_n}{Y_j!} \times \frac{1}{1 - \rho_j} \quad \forall j \in N \cup N'
\]

Based on previous notations Formula 13 will be concluded as follows:

\[ \frac{\pi_j^n \times 1}{Y_j!} \times \frac{\rho_j^{b+Y_j+1}}{Y_j - b - Y_j} \leq 1 - \alpha \]

**Model formulation**

Summing up we will solve following maximal covering location problem with using aforementioned formulas:

\[
\text{Max } Z = \sum_{j \in N} S_j
\]

\[
\sum_{j \in N} Y_j = M \quad \forall j \in N
\]

\[
\frac{\pi_j^n \times 1}{Y_j!} \times \frac{\rho_j^{b+Y_j+1}}{Y_j - b - Y_j} \leq 1 - \alpha
\]

\[
P_j = \sum_{i \in N} e^{b_j} + \sum_{i \in N} e^{b_j} \quad \forall i \in N, j \in N \cup N'
\]

\[
\tilde{\phi} = \sum \phi_j \quad \forall j \in N \cup N'
\]

\[
\rho_j = \frac{\tilde{\phi}}{Y_j \mu_j}
\]

\[
p_j \leq Y_j \quad \forall j \in N
\]

\[
Y_j = 0, 1, 2, ..., M \quad \forall j \in N
\]

**Proposed algorithms**

**Genetic algorithm (GA)**

In this paper, the study will use Alp et al. (2003) proposed genetic algorithm, because of its simple and fast method in solving problems and its excellent capability to generate solutions. The algorithm will be discussed as follows, for more explanations on this algorithm their research is proposed.

**Encoding and fitness function:** The study will use a simple encoding where the genes of a chromosome correspond to the indices of the selected facilities. The fitness function will be easily calculated with using the problem data.

**Population size and initializing the population:** The two important factors of population size are as: every gene must be present in the initial problem and the population size should be proportional to the number of solutions will be responding to extension of feasible solutions with a formula proposed in the following.

\[
\text{Population Size (total nodes, number of servers) =} \left[ \max \left( \frac{\text{total nodes} \times \text{ln}(S)}{100} \right) \right]^d
\]

Let \( S = C \left( \frac{\text{total nodes}}{\text{number of servers}} \right) \) be the number of all
possible solutions to problem, and
\[ d = \left\lfloor \frac{\text{total nodes}}{\text{number of servers}} \right\rfloor \]
the rounded-up density of the problem. If \( \frac{\text{total nodes}}{\text{number of servers}} \) is an integer then each gene is represented in the initial population with an equal frequency. If \( \frac{\text{total nodes}}{\text{number of servers}} \) is not an integer then after disturbing all of the genes from 1 to number of servers to each group, we allocated random genes to fill empty slots.

Generating new members: Different with the previous algorithm, we use Alp et al. (2003) proposed method for generating new members. They take the union of the genes of the parents, obtaining an infeasible solution with \( m \) genes where \( m = \text{total nodes} \) and then for reducing the number of genes by one, discard the genes whose discarding produces the best fitness function value until reach \( \text{total nodes} \). However, genes that are present in both parents never must be dropped. We call the infeasible solution obtained after the union operation the "draft member" and the feasible solution generated by the heuristic as the "candidate member". The input of the generation process is two different members and the output will be a candidate member.

Mutation and replacement: As far as the mutation operator is negligible we decided not to use it. The replacement operator will be operated only on \( N' \). The steps for the replacement operator are as follows (Alp et al., 2003):

Input: One candidate member.
Step 1. If fitness value of the input candidate member is higher than the maximum fitness value in the population, then discard this candidate member and terminate this operator.
Step 2. If the candidate member is identical to an existing member of the current population, then discard this candidate member and terminate this operator.
Step 3. Replace the worst member of the population with the input candidate member.
Step 4. Update the worst member of the population.
Step 5. Update the best member of the population.
Output: Population after introducing the candidate member.

Termination: The algorithm terminates after observing \( \left\lfloor \frac{\text{total nodes} \sqrt{\text{number of servers}}}{4} \right\rfloor \) successive iterations reach the best solutions and after observing \( \left\lfloor \frac{\text{total nodes} \sqrt{\text{number of servers}}}{4} \right\rfloor^2 \) successive iterations where the best solution found has not changed. The iteration consists of one use of the generation and replacement operators.

Simulated annealing algorithm (SA)

Simulated annealing is a local search-based heuristic that is designed to escape from being trapped into a local optimum by accepting worse solutions during its iterations. SA was introduced by Metropolis et al. (1953) and popularized by Kirkpatrick et al. (1983) that is adopted from the "annealing" process used in the metallurgical industry. Annealing is the process by which slow cooling is applied to metals to produce better aligned, low energy-state crystallization. The optimization procedure of SA searches for a (near) global minimum mimicking the slow cooling procedure in the physical annealing process. It starts from a random initial solution. A new solution is taken from the predefined neighborhood of the current solution in each iteration. For determining whether an improvement has been achieved or not, the objective function value of this new solution is then compared with that of the current best solution. If the objective function value of the new solution is better, the new solution becomes the current solution from which the search continues by proceeding with a new iteration.

A new solution with a degraded (larger) objective function value may also be accepted as the new current solution, with a small probability determined by the Boltzmann function, \( \exp(-\Delta / k T) \), where \( \Delta \) is the difference of objective function values between the current solution and the new solution, \( k \) is a predetermined constant and \( T \) is the current temperature. The basic idea is not to restrict the search to those solutions that decrease the objective function value, but also allow moves that increase the objective function value. This mechanism may avoid the procedure being trapped prematurely in a local minimum (Yu et al., 2009).

Subsequently, we discuss the proposed SA heuristic in detail, the generation of the initial solution, the calculation of the objective function value, various types of neighborhood and the parameters that are used.

Notation: \( \text{In\_loop\_iteration} \): Maximum number of iterations at each temperature; \( T_{in} \): Initial temperature. \( T_f \): Final temperature. \( \text{Fitness\_function} \): Fitness value or the objective function. \( \text{Number\_Failed\_Iteration} \): number of non-improving iterations. \( \text{Population\_size} \): Size of the population’s solutions that is constant at the beginning of algorithm performance. \( \text{Iteration\_coeficient} \): Coefficient that related to \( \text{number\_failed\_iteration} \).

Step1: Randomly generate the initial population of an arbitrary size and calculate the best fitness value.
In_loop_iteration).
Step 2: Parameter initialization;
Step 2.1: Set the annealing parameters: In_loop_iteration, \( T_{in} \), \( T_f \), Number_Failed_Iteration and Iteration_Coefficient , population_size.
Step 2.2: Initialize the iteration counter; iter=0;
Step 3: Annealing Schedule;
Step 3.1: Inner loop initialization; il=0;
Step 3.2: If (il \leq \text{in_loop_iteration}).

If random (0, 1) \geq 0.8, then calculate function coefficients in the zero condition (when there is no server located in the situation) and in the other values. Add 1 to the maximum objective function in zero values and subtract 1 to the minimum objective function in other values. Else randomly change one 0 to 1 and subtract 1 from other values.

Step 3.2.1: il=il+1;
Step 3.2.2: Generate a neighborhood solution (which satisfies the constraints). Calculate the fitness value \( (\text{fitness function})_i \).
Step 3.2.3: \( e = (\text{fitness function})_i - (\text{fitness function})_{i-1} \).
Step 3.2.4: If (e \geq 0) or [Random (0,1) \leq e(\epsilon )], THEN accept the new solution, \( \text{Solution} = (\text{fitness function})_i \); else reject the new solution;
Solution = \( (\text{fitness function})_{i-1} \).
Step 3.2.5: If (il \geq \text{in_loop_iteration}), then terminate inner loop and go to Step 3.3 else continue inner loop and go to Step 3.2.
Step 3.3: \( T_{iter+1} = T_{iter} / (1 + \beta * T_{iter}) \)
Step 3.4: If \( (T_{iter+1} \leq T_f) \), then \( \text{Iter} = \text{Number Failed Iteration}; \) else \( \text{Iter} = \text{Iter} + 1 \);
Step 3.5: IF (Iter \geq \text{Number Failed Iteration}), then terminate inner loop and go to Step 4, else continue inner loop and go to Step 3.1.
Step 4: Terminate the best solution, \( \text{Solution} \) and stop.

**Cooling schedule:** The cooling schedule, in turn, is specified by:

(a) An initial (and final) value of the temperature,
(b) An updating function for changing the temperature and
(c) An equilibrium test.

The “behavior” of the simulated annealing algorithm depends on the temperature \( T \). Perhaps the most important thing is how the initial temperature \( T_0 \) is determinate. If the initial value of the temperature is chosen too high, then too many bad uphill moves are accepted while if it is too low, then the search will quickly drop into a local optimum without possibility to escape from it.

Other researchers have tried the inhomogeneous annealing. In this case, the cooling schedule used is due to Lundy and Mees (1986) with the schedule length (the number of trials) being fixed a priori. In Connolly’s algorithm (Connolly, 1990), the initial temperature is calculated according to the formula

\[
T_{in} = (\Delta f_{max}) + 0.1(\Delta f_{max} - \Delta f_{min})
\]

(24)

Where, \( \Delta f_{min} \), \( \Delta f_{max} \) is, respectively, minimal and maximal difference of the objective Function values obtained in initial pool with population size that determine in problem.

The temperature is not a constant, but changes (usually, decreases) over time according to some updating function. The most commonly used schedules are (Lidy et al., 1986):

\[
T_{i+1} = T_f / (1 + \beta T_f)
\]

(25)

The \( \beta \) is defined by (\( L \) is the number of failed iteration):

\[
\beta = (T_{in} - T_f) / LT_{in} T_f
\]

(26)

**Termination criterion:** In theory the simulated annealing procedure should be continued until the final temperature. \( T_f \) is zero, but in practice other stopping criteria are applied. In this paper, we would suggest stopping criteria that depend on the problem parameters.

\[
\frac{\text{Number Failed Iteration}}{\text{Iteration Coefficient} \times \text{(Total Nodes)}} - \frac{1}{2}
\]

(27)

**NUMERICAL EXAMPLES AND THE RESULTS**

To solve the problems, a MATLAB R 2009-32 BIT computer program was used to obtain the local optimum solution of the same problems with GA and SA algorithms. We use JMP version 8.0 to setting algorithm parameters and problem parameters. At first we run a 17 nodes problem that (Table 1) demand rates of the nodes (\( \mu_i \)), distances between the nodes (\( d_{ij} \)) and service rate (\( \mu_i \)) are randomly generated from [80, 110], [6, 25] and [400, 450], respectively. We assume to locate a server on node 1. Problem parameters are \( \alpha \), \( \sigma \), maximum queuing length and maximum time waiting. Problem has 4 parameters. Therefore, maximum number of experiment for this especial problem is \( 2^4 \).
As far as the GA algorithm does not have any parameters the GA parameters are opted base on problem parameters. For tuning the problem parameters, the partial factorial designs with $2^k$ has been used.

Experiments are designed and run and the fitness functions are obtained based on Table 2. Considering the average of fitness function as the response variable and the four parameters as independent variables and using JMP 8.0 DOE Toolbox for setting problem parameters. The amounts of problem parameters are $\alpha = 0.625$, $\sigma = 450$, maximum queuing length = 6 and maximum time waiting = 6.5 after setting problem parameters.

Then these problem parameters will be used in SA. For Tuning the SA parameters, the SA parameters including Iteration_Coefficient, In_loop_Iteration, population_size, and $T_f$ ($T_f$ is assumed 0.000001 in all part of experiments), the partial factorial designs with $2^k$ has been used. Each numerical problem is run two times, 24 experiments are designed and run and the fitness functions are obtained (Table 3).

The amount of SA parameters after setting parameters will be as following: In loop iteration = 16 (the result was 16.5 but it must change to the real number and it was changed to 16), population size = 135, coefficient iteration = 135. In Table 4 distinctions of these two algorithms (SA and GA) with set parameters will be considered.

The same process had been done for problems with 30, 40, 50, 60, 70 nodes. But because of the limited space the results will be only considered for the 30 to 70-node problems. In Tables 5 to 9 a comparison between results based on the genetic algorithm and simulated annealing is drawn and the percent of the difference among these algorithms are represented. Furthermore, As far as the $Y_j$ is the upper bound in Equation 8; this problem cannot be solved with the Lingo. A computer with Core 2 Duo 2.80 GHz CPU, 3.00 Cache and 4096 MB RAM was used. Finally, in the Figures 1 and 2, a comparison of these two solution algorithms based on the running time and objective function will be considered.

**CONCLUSIONS AND FUTURE RESEARCH**

This work presented a new and original mathematical model for location problem in the competitive markets, since the proposed model computationally belongs to the class of NP-Hard problems, a genetic algorithm and simulated annealing are developed to solve the model. Based on the test runs, the genetic algorithm works more satisfactory than the simulated annealing. The proposed GA and SA can also be applied toward solving the LSCP, MCLP, and MALP with limited modifications. As far as the genetic algorithm is efficient for different problems, in our case this algorithm shows a salient result in comparison to the simulated annealing, especially in reducing running times, but comparing the results of GA and SA based on the objective function represent that there are closely similar and can be easily concluded that the simulated annealing is enough
Table 2. The proposed genetic algorithm results for two times running.

<table>
<thead>
<tr>
<th>S/N</th>
<th>α</th>
<th>Sigma</th>
<th>Max queuing length</th>
<th>Maximum time waiting</th>
<th>GA objective</th>
<th>The average of objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.3</td>
<td>200</td>
<td>2</td>
<td>3</td>
<td>1794.6341</td>
<td>1794.6341</td>
</tr>
<tr>
<td>2</td>
<td>0.3</td>
<td>200</td>
<td>2</td>
<td>10</td>
<td>1781.3204</td>
<td>1783.1398</td>
</tr>
<tr>
<td>3</td>
<td>0.3</td>
<td>200</td>
<td>10</td>
<td>3</td>
<td>1787.9665</td>
<td>1789.6507</td>
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<tr>
<td>4</td>
<td>0.3</td>
<td>200</td>
<td>10</td>
<td>10</td>
<td>1784.9592</td>
<td>1793.0273</td>
</tr>
<tr>
<td>5</td>
<td>0.3</td>
<td>700</td>
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<td>3</td>
<td>1778.2379</td>
<td>1781.6158</td>
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<tr>
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<td>10</td>
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<td>1793.2954</td>
</tr>
<tr>
<td>7</td>
<td>0.3</td>
<td>700</td>
<td>10</td>
<td>3</td>
<td>1788.2128</td>
<td>1788.2128</td>
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<tr>
<td>8</td>
<td>0.3</td>
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<td>10</td>
<td>1801.5970</td>
<td>1798.2556</td>
</tr>
<tr>
<td>9</td>
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<td>200</td>
<td>2</td>
<td>3</td>
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<td>1791.3003</td>
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<tr>
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<td>0.95</td>
<td>200</td>
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<td>10</td>
<td>1794.6341</td>
<td>1794.6341</td>
</tr>
<tr>
<td>11</td>
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<td>200</td>
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<td>3</td>
<td>1784.9592</td>
<td>1786.4629</td>
</tr>
<tr>
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<td>10</td>
<td>1781.3204</td>
<td>1781.3204</td>
</tr>
<tr>
<td>13</td>
<td>0.95</td>
<td>700</td>
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<tr>
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<td>10</td>
<td>10</td>
<td>1794.9142</td>
<td>1791.5635</td>
</tr>
</tbody>
</table>

Efficient, too.

Some extensions of this research might be of interest. Improving this model to multi objective model and using fuzzy theory to converting this model to a fuzzy model.
### Table 3. The proposed simulated annealing results for two times running.

<table>
<thead>
<tr>
<th>S/N</th>
<th>In loop iteration</th>
<th>Population size</th>
<th>Coefficient iteration</th>
<th>SA objective</th>
<th>The average of objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>20</td>
<td>20</td>
<td>1737.2</td>
<td>1745.80</td>
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<td>3</td>
<td>20</td>
<td>250</td>
<td>1730.4</td>
<td>1735.55</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>1740.7</td>
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</tr>
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<td>3</td>
<td>250</td>
<td>20</td>
<td>1801.5</td>
<td>1794.850</td>
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<td></td>
<td>1788.2</td>
<td></td>
</tr>
<tr>
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<td>3</td>
<td>250</td>
<td>250</td>
<td>1788.2</td>
<td>1783.25</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>1778.3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>20</td>
<td>20</td>
<td>1727.3</td>
<td>1724.20</td>
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<td></td>
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<td>1721.1</td>
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<td></td>
<td>1788.2</td>
<td></td>
</tr>
<tr>
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<td>30</td>
<td>250</td>
<td>20</td>
<td>1761.2</td>
<td>1767.90</td>
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<td>30</td>
<td>250</td>
<td>250</td>
<td>1764.4</td>
<td>1759.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1754.3</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4. A comparison of the results obtained from the GA against SA for 17 nodes problem.

<table>
<thead>
<tr>
<th>GA</th>
<th>SA</th>
<th>Lingo</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Run time</td>
<td>Cover nodes</td>
<td>1794.8384</td>
</tr>
</tbody>
</table>

### Table 5. A comparison of the results obtained from the GA against SA for 30 nodes problem.

<table>
<thead>
<tr>
<th>GA</th>
<th>SA</th>
<th>Lingo</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Run time</td>
<td>Cover nodes</td>
<td>2982.0388</td>
</tr>
</tbody>
</table>

### Table 6. A comparison of the results obtained from the GA against SA for 40 nodes problem.

<table>
<thead>
<tr>
<th>GA</th>
<th>SA</th>
<th>Lingo</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Run time</td>
<td>Cover nodes</td>
<td>3982.8588</td>
</tr>
</tbody>
</table>

### Table 7. A comparison of the results obtained from the GA against SA for 50 nodes problem.

<table>
<thead>
<tr>
<th>GA</th>
<th>SA</th>
<th>Lingo</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Run time</td>
<td>Cover nodes</td>
<td>4979.7265</td>
</tr>
</tbody>
</table>
Table 7. A comparison of the results obtained from the GA against SA for 50 nodes problem.

<table>
<thead>
<tr>
<th>GA</th>
<th>SA</th>
<th>Lingo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Run time Cover nodes</td>
<td>Objective Run time Cover nodes Out of bound</td>
<td></td>
</tr>
<tr>
<td>4979.7265 324.7147 1(1),18(2),38(2)</td>
<td>4921.2270 729.4742 1(1),2(1),3(1),21(1),40(1)</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Table 8. A comparison of the results obtained from the GA against SA for 60 nodes problem.

<table>
<thead>
<tr>
<th>GA</th>
<th>SA</th>
<th>Lingo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Run time Cover nodes</td>
<td>Objective Run time Cover nodes Out of bound</td>
<td></td>
</tr>
<tr>
<td>5988.0369 592.1997 1(1),18(2),38(1),57(1)</td>
<td>5929.3813 1357.8546 2(1),3(1),38(1),56(1)</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Table 9. A comparison of the results obtained from the GA against SA for 70 nodes problem.

<table>
<thead>
<tr>
<th>GA</th>
<th>SA</th>
<th>Lingo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Run time Cover nodes</td>
<td>Objective Run time Cover nodes Out of bound</td>
<td></td>
</tr>
<tr>
<td>6986.1827 1195.5273 1(1),18(1),38(1),57(1),61(1)</td>
<td>6891.7000 2336.1143 1(1),2(1),3(1),6(1),62(1)</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Figure 1. Comparison of GA and SA based on the run time criterion.

Figure 2. Comparison of GA and SA based on the objective function criterion.
can be named as an extension to this research.

REFERENCES


Common risk factors in the returns of non oil based stocks in Tehran Stock Exchange: The case of close economy

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This study aims to test arbitrage pricing theory (APT) using monthly data from the non oil based companies in Iranian stock market that works on the sanctioned economy during 1991 to 2008. Tests were conducted using the principal component analysis, cross sectional regression and canonical correlation analysis. Overall, the findings document is a weak applicability of APT in this market. The evidences point to at least one factor but probably about two factors explained the cross-section of expected returns on Tehran Stock Exchange (TSE). Financial and economical sanctions have less effect on non oil industry in Iran. 

Key words: Sanctioned economy, non-oil based companies, arbitrage pricing theory.

INTRODUCTION

Asset prices are commonly believed to react sensitively to economic news. Daily experience seems to support the view that individual asset prices are influenced by a wide variety of unanticipated events and that some events have a more pervasive effect on asset prices than do others (Chen et al., 1986). Thus, various asset pricing models can be used to determine equity returns. The one-factor capital asset pricing model (CAPM) is the dominant asset pricing model in the literature but a few multi-factor asset pricing models have also been derived. Probably the most famous multi-factor model is the Ross’s arbitrage pricing theory (APT) which was developed in the year 1976. The capital asset pricing theory begins with an analysis of how investors construct efficient portfolios and the theory has its basis in mean-variance analysis. The APT comes from an entirely different family. It does not ask which portfolios are efficient. Instead, it starts by assuming that equity’s return depends partly on pervasive macroeconomic influences or factors and partly on noise (Brealey et al., 2006). The APT has been empirically studied in several markets, for example Antoniou and Priestley (1998) implemented it to London Stock Exchange, Dhankar and Esq (2005) to Indian stock market, Berry et al. (1988) to S & P 500 and Chen et al. (1988) to New York Stock Exchange, Azeez and Yonezawa (2003) to Japanese stock market, Anatolyev (2005) to Russian stock markets and finally Lim and Ariff (2005) to Malaysian Stock Market. However, none of previous studies try to implement the APT to sanctioned economy. To the best of our knowledge, this is the first study that tests the APT in Tehran Stock Exchange (TSE) that is active in sanctioned economy. Main challenge in Iran’s economy is the existing sanctioned economy. Since Iran inception in 1979, the US and majority of world have imposed economic and financial sanctions on Iran. These sanctions on Iran have been in various forms until the present time (Torbat, 2006). According to Alikhani (2000), the world sanctions have caused damages to the Iranian
economy and cause volatility in macroeconomic variables. The financial sanctions' impact on Iran has been greater than those due to the economical sanctions. The financial sanctions have curtailed Iran's ability to borrow funds to finance its development projects. Iran has paid higher rates of interest on its loans because of the sanctions and has guaranteed excessively high rates of return on investment on its projects (Torbat, 2006). Researchers have typically found that the company stock reacts negatively to the announcement of sanctions (Griffin et al., 2004). They also found that, the stock reacts negatively to the notification sanctions, with effects that persist for several months. The sanction nature of Tehran stock market, distinguished by high degrees of political and in fact, economic instability, might have a remarkable outcome on the set of variables that proxy for equity risk. The investment decision in Iran is complicated because the risks are difficult to evaluate and often non-quantifiable (Hakim, 2008).

According to nature of the sanctions, most of financial and economical sanctions affect oil industry. If oil based companies remove from the sample, are financial and economical sanctions affects non oil based companies? In this case which macroeconomic variables are source of systematic risks for them? Therefore the main objective of this study is to test the applicability of the APT as a theory of asset pricing in Tehran stock exchange (TSE) that active in sanctioned economy by using unidentified non oil based factors and macroeconomic variables. This study aims to examine whether economical and financial sanctions adversely affect non oil based securities returns. This is done first by identifying the macro APT-relevant factors that affect non oil based security returns. Perhaps factors peculiar to an emerging sanctioned economy may be identified and this will increase the explanatory power of the APT by extending the factor matrix to include factor(s) relevant to less developed economies. By removing the oil companies from the samples, the intention of this study is to test arbitrage pricing theory on non oil based companies.

There were some previous studies on the world sanction effect on Iran economy, like Alihkan (2000) and Torbat (2006) but they used short time frame period in their studies. Also, there are some previous research that studied APT in Tehran stock exchange like Rahmani and Sheri (2006) and Mohseni (2007). Since they used a few of macroeconomic variables and short time frame work, their research were not reliable. Moreover, none of previous studies in APT are focusing the effect of economical and financial sanction on stock returns and its instability. This study aims to fill the following gaps: The lack of similar studies in Tehran stock exchange market on the APT, this study aims to achieve empirical investigation of APT in sanctioned economy by using non oil based companies and this study will examine the existence of arbitrage opportunity in the Iranian stock market during sanctions period. Also, the study aims to provide a comprehensive analysis on macroeconomic variables concurrently that will integrate all fragmented studies being done previously on Tehran stock exchange. This study investigates the behavior of non oil based security prices on the Tehran stock exchange (TSE), a financial market in Middle East that has received little attention by practitioners.

However, there is no formal theory for identification of the factors in APT. The identified factors are driven by economic theories. Therefore, the methodology chosen can be crucial for the identification of macroeconomic variables that influence stock returns. This study will employ factor analysis and canonical correlation analysis to identify whether macroeconomic variables influence non-oil based stock returns. This study provides a test of the APT in Tehran stock market that practice in the economy under the financial and economical sanctions. Also, this study aims to see the effect of economical and financial sanction on non-oil based stock returns and its volatility in TSE with the fairly acceptable period of 1991 to 2008 and two sub-periods using macroeconomic variables.

The paper is organized as follows: summary of the evidence on APT; explanation of the data and methodology; presentation of the findings; and conclusion of the paper.

EVIDENCE AND STATE OF THE KNOWLEDGE

The APT has been modestly tested ever since it was first proposed in 1976. The earliest tests used the factor analytic (FLM) approach pioneered by Gehr (1978) and later extended by Roll and Ross (1980). Later empirical work increasingly used the macroeconomic variables model. Chen et al. (1986) first used this pre-specification of macro variables approach in 1986. Empirical tests using factor analysis or principal components analysis primarily involve determination of the number of significant factors (by determining the number of risk premium, \( E_i \) to \( E_o \), which are significantly different from zero) and determining whether the constant, \( E_0 \) is the same across securities groups. The earliest tests were conducted by Roll and Ross (1980) who tested the APT using maximum likelihood factor analysis on daily US data from 1962 to 1972.

Fogler et al. (1981) were to allocate economic meaning to stock market factors and to conclude the degree to which these factors were concerned to the prices of capital in the bond market. Canonical correlation analysis was employed to establish whether a linear combination of the first principal component was concerned to a linear combination of the stock market, 3-month government and Aa utility. They noted that the returns from stock groups were exposed to relate to returns in the Government bond market and to share bonds with default
risk. In addition, the returns of bond market variables were established to relate to the stock factors resulting from all one hundred stocks, while those bonds with default risk introduce a very weak connection. Leuedecke (1986) and Faff (1988) working on Australian data used principal component analysis method. The study found one dominates factor and three other significant factors of lesser explanatory power. Ariff and Johnson (1990) investigated data over the period from 1975 to 1988 on monthly returns on 252 common stocks traded on stock exchange of Singapore. The stocks were categorized on the foundation of average returns into 17 portfolios. The FIML technique was used and out of five macroeconomic variables measured, three—-inflation, tonnage of cargo as port, business expectations and dominate market factor were established to be significant. In a study of the Italian stock market using a sample of 30 shares over the period from January 1990 to June 2001, Cagnetti (2002) using principal components analysis found five factors to be relevant with the first factor explaining nearly 40% of the total variance. Christoff et al. (1993) applied the canonical correlation analysis as an alternative method to factor analysis to obtain a solution of the asset pricing equation. The main conclusion was that profitability might be considered as the single most important factor that influence security returns. Also, the composite lagging economic indicators appear to be more useful to investors in forming market expectations than the composite leading economic indicators. Elton et al. (1995) employed the MVM APT model to scrutinize the performance of bond funds. To study which of the macro variables that they have been selected were concerned to the bond returns they employed canonical correlation.

To test the APT limitations on the macro variables on four alternative models they after that employed iterated non-linear seemingly unrelated regressions. They noted that in favor of models that contained the variables the models that did not include the macroeconomic variables were rejected at the five percent level. Hudgins and Turner (1995) noted no function of exchange rate in the U.S. for the APT model.

Rensburg (2000) examined the Chen et al. (1986) pre-specified variable procedure to priced APT identification on the Johannesburg stock exchange (JSE). In this investigation, he employed an independent and more current share sample than that used by Rensburg (1996, 1997).

Rensburg used the vector autoregressive regression (VAR) methodology; unanticipated activities in the factors were extracted accounting for the analytical power of the other sequences in the structure of investor anticipations. This research demonstrated that a two indices model, namely employing returns on the all-gold, and Industrial Indices as explanatory variables considers the effect of the other pre-specified macroeconomic variables on equity returns.

In Iran, Mohseni (2007) carried out APT for some accepted firms in Tehran stock exchange market. The firm monthly data between July 2002 and February 2003 were measured for the parameters of this model with the aid of Fama and Macbeth methods. Two risk factors were measured for these groups of firms (money supply and oil price) and the sensitivity of each firm’s return was estimated by the mentioned two factors. Risk rewards, factors privileges and the return without risk were measured for difference month and thus concerning the results, APT model test was established for these firms.

DATA AND METHODOLOGY

Iran has a different calendar from the other countries. Its Calendar based on Hegira Shamsi that the beginning of the year is in the 20th March and ended on 19th March of the year which firms should have activities based on this calendar in TSE. The analysis period in this study, covers 17 years from 20th March 1991 to 19th March in 2008. This is by far the longest and most update period employed for any study on the APT in Iran. Due to the economic sanction nature and 1997 crisis as well as financial sanction nature the full period is divided into two periods, 1991 to 1998 and 1999 to 2008, respectively. As a result of the availability of smaller stocks on the main board of the TSE in the earlier years, the number of stocks in the sample was consequently limited. The stocks chosen in this research are taken randomly from Main Board of Tehran stock exchange market (TSE). Nevertheless, there are 80 stocks chosen, 20 stocks were removed because of the missing observations during the study period. Thus, full data put from 20th March 1981 to 19th March 2008 has 80 stocks in the 17-year full period and first sub period. By removing 7 oil companies all the tests are conducted for 53 non- oil based individual securities and also 20, 15, 10 and 5 portfolios for the full period and first sub-period. Since the number of securities increased for the period beyond 1998, new stocks were included in the sample. So, 160 stocks were chosen for the second sub-period. We used 145 non oil based securities in second sub-period by removing 15 oil companies from 160 whole companies. So, all the tests are conducted for 145 non- oil based individual securities and also 20, 15, 10 and 5 portfolios for the sub- period two.

The main objective of this study is to test APT in the Tehran stock exchange (TSE) using unidentified non oil based factors and macroeconomic variables. This study also examines the impact of economical and financial sanctions on non oil based stock market returns. This is done first by identifying the macro APT-relevant factors that affect security returns, and after which extending the factor matrix to include factor(s) relevant to less developed economies. In the above section, it was shown that different methodologies and research designs have been used to test APT in different markets. This study tests the APT using factor analysis with principal component analysis and canonical correlation analysis (CCA).

The test is carried out before and after a financial crisis that destabilized the economy to ascertain the impact of the structural changes in the economy and the securities market as a consequence of the crises. The stock price data for this study are the monthly returns on stocks on the main board of the TSE. The returns are calculated using month-end prices, that is, \( R_t = (P_t - P_{t-1}) / P_t \), where \( P_t \) is the return per period \( t \) for the period being computed, \( P_t \) is the price of the stock at the end of the period \( t \), and \( P_{t-1} \) is the price of the stock at the end of the period \( t-1 \). The returns are adjusted for dividends, bonus issues, rights issues and stock splits.
Based on the studies by Chen et al. (1986); Clare and Priestley (1998) and Mohseni (2007), a variety of macroeconomic and financial factors and a proxy for the market were selected, inclusive of those factors that are peculiar to TSE. Variables selected were consumer price index (CPI), trade balance, money supply (M₁, M₂), exchange rate (Rial / US$), central bank reserve, volume of stock transaction of TSE, Tehran price index (TEPIX), oil price, production of crude oil, export of crude oil, gross domestic product (GDP) and profit rate proxy (ROE of banks). Monthly data was used and all the economic variables are measured by rate of change rather than absolute values.

The procedure to test the APT is as follows: First, factor analysis with principal component analysis (PCA) was applied to determine the individual securities and portfolios factor loadings estimates to explain the cross-sectional variation of individual and portfolios estimated returns. Second, cross-sectional regressions were run to determine the number of priced factors to measure the size and statistical significant of risk premium associated with the estimated factors from the common factors extracted in the first stage. This procedure was repeated for individual securities and different size of portfolios for full period and two sub-periods separately. The reasons why stocks are grouped into portfolios are to eliminate of portfolios for full period and two sub-period separately. The statistical significant of risk premium associated with the estimated returns. Second, cross-sectional regressions were run to explain the cross-sectional variation of individual and portfolios. Dummy variables take 1 during the period of 1996 to 2008. It is 0 during the period of 1991 to 2002. It is 0 otherwise. Financial sanctions on TSE. Economical dummy variables take 1 if the periods. The results of principal components analysis were presented in Tables 1 to 3. The Kaiser-Meyer-Olkin test (KMO) value was 0.60 to 0.79 and the Bartlett’s test of sphericity was significant at above the 99% acceptance level indicating that the principal components factor analysis is appropriate for this data set. Consistent with the literature, the number of common factors that the researcher is able to extract by employing principal component analysis increases linearly with the sample size increase. This way can be seen in the finding for non oil based companies. The number of common factors increases from 1 as smallest sample to 23 as largest sample for non oil based companies. However, the average numbers of smallest sample for non oil based companies are two factors. That is, factor specificity in the case of smaller sample means that only about two factors are relevant for inter-temporal pricing of the securities in small samples. This outcome is consistent with Kryzanowski and To (1983); Dhrymes et al. (1984) and Diacogiannis (1986).

Cross- sectional two stage OLS regression was applied to test the main specific objectives of this study. The objective is to test the applicability of the APT in non oil based companies that is active in Tehran stock exchange (TSE). According to the objective, the main hypothesis was examined. The hypothesis implies that: due to effect of financial and economical Sanctions on oil sections more than the other economical sections in Iran, the priced factors are equal to zero in nonoil based companies. The null hypothesis will reject if at least one priced factor find in the results. Nevertheless, F test and t- test show that for all the samples in all periods, minimum one factor and maximum fourteen is significant at the five percent level. The significant F values of all the samples are 100%. The evidence points to at least one factor but probably about two factors that explain the cross-section of expected returns on non oil based companies in Tehran stock market in the all periods. Results obtained here support APT hypothesis that at least the risk premia is not significant from zero in non oil based companies. Therefore, the null hypothesis related to the hypothesis of this study is rejected and we can accept the alternative hypothesis. With regard to Hughes (1982) for the Canadian stock market returns, these results are inconsistency with the results of open economy. According to Roll and Rose (1980) and Chen...
Table 1. Factor analysis and cross-sectional regression of average returns against factor scores coefficients - full period.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>53 Individual securities</th>
<th>20 Portfolios</th>
<th>15 Portfolios</th>
<th>10 Portfolios</th>
<th>5 Portfolios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total variance explained</td>
<td>70%</td>
<td>60%</td>
<td>57%</td>
<td>56%</td>
<td>55%</td>
</tr>
<tr>
<td>No. of common factors</td>
<td>20</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>No. of the priced factors</td>
<td>11</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>λ1</td>
<td>2.16*** (8.49)</td>
<td>8.35*** (14.11)</td>
<td>12.44*** (16.36)</td>
<td>38.32*** (44.39)</td>
<td>78.66*** (36.22)</td>
</tr>
<tr>
<td>λ2</td>
<td>2.76*** (10.94)</td>
<td>6.96*** (14.11)</td>
<td>12.02*** (8.64)</td>
<td>47.63*** (77.32)</td>
<td></td>
</tr>
<tr>
<td>λ3</td>
<td>2.17*** (7.95)</td>
<td>9.23*** (14.46)</td>
<td>25.70*** (42.61)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ4</td>
<td>1.78*** (11.66)</td>
<td>5.80*** (2.79)</td>
<td>11.98*** (11.42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ5</td>
<td>1.22*** (6.42)</td>
<td>5.91*** (22.97)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ6</td>
<td>1.39*** (5.11)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ7</td>
<td>1.35*** (5.88)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ8</td>
<td>1.5** (9.41)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ9</td>
<td>1.73*** (10.20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ10</td>
<td>0.83*** (5.71)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ11</td>
<td>0.36*** (2.11)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d_{financial}</td>
<td>-0.22 (-0.16)</td>
<td>-1.34 (-1.05)</td>
<td>-0.74 (-0.67)</td>
<td>-3.20** (-2.20)</td>
<td>-17.55*** (-5.07)</td>
</tr>
<tr>
<td>d_{economical}</td>
<td>0.24 (0.11)</td>
<td>-0.63 (-0.55)</td>
<td>-0.69 (-0.62)</td>
<td>-2.87* (-1.92)</td>
<td>-12.53*** (-3.34)</td>
</tr>
<tr>
<td>F</td>
<td>89.41</td>
<td>341.06</td>
<td>825.95</td>
<td>2402.46</td>
<td>523.83</td>
</tr>
<tr>
<td>Sig.F</td>
<td>0.00***</td>
<td>0.00***</td>
<td>0.00***</td>
<td>0.00***</td>
<td>0.00***</td>
</tr>
<tr>
<td>KMO</td>
<td>0.61</td>
<td>0.71</td>
<td>0.72</td>
<td>0.72</td>
<td>0.73</td>
</tr>
</tbody>
</table>

Note: N = No. of factors from factor analysis; t-values in bracket. Only priced factors at 1, 5 and 10% significant level are shown. *Significant at 10% level. ** Significant at 5% level. *** Significant at 1% level.

Table 2. Factor analysis and cross-sectional regression of average returns against factor scores coefficients - first sub period.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>53 Individual securities</th>
<th>20 Portfolios</th>
<th>15 Portfolios</th>
<th>10 Portfolios</th>
<th>5 Portfolios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total variance explained</td>
<td>76%</td>
<td>65%</td>
<td>69%</td>
<td>60%</td>
<td>74%</td>
</tr>
<tr>
<td>No. of common factors</td>
<td>18</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>No. of the priced factors</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>λ1</td>
<td>4.13*** (9.14)</td>
<td>11.55*** (22.82)</td>
<td>16.88*** (30.31)</td>
<td>53.50*** (42.94)</td>
<td>95.45*** (28.77)</td>
</tr>
<tr>
<td>λ2</td>
<td>2.79*** (11.19)</td>
<td>9.87*** (16.76)</td>
<td>11.63*** (33.07)</td>
<td>37.44*** (37.98)</td>
<td></td>
</tr>
<tr>
<td>λ3</td>
<td>2.77*** (11.39)</td>
<td>7.67*** (10.90)</td>
<td>11.99*** (11.58)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ4</td>
<td>1.87*** (6.59)</td>
<td>8.38*** (7.81)</td>
<td>14.77*** (26.25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ5</td>
<td>1.96*** (6.60)</td>
<td>6.78*** (9.79)</td>
<td>11.82*** (33.43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ6</td>
<td>1.39*** (5.11)</td>
<td>1.85*** (7.91)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ7</td>
<td>2.58*** (8.95)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ8</td>
<td>1.40** (3.09)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>λ9</td>
<td>0.65*** (2.70)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d_{financial}</td>
<td>-0.51 (-0.87)</td>
<td>-0.51 (-0.88)</td>
<td>0.33 (0.35)</td>
<td>-0.46 (-0.32)</td>
<td>-0.82 (-0.15)</td>
</tr>
<tr>
<td>d_{economical}</td>
<td>0.60 (0.61)</td>
<td>-0.63 (-0.77)</td>
<td>0.26 (0.65)</td>
<td>-0.44(-0.31)</td>
<td>-0.54 (-0.28)</td>
</tr>
<tr>
<td>F</td>
<td>26</td>
<td>682.81</td>
<td>104.49</td>
<td>808.34</td>
<td>2871.32</td>
</tr>
<tr>
<td>Sig.F</td>
<td>0.00***</td>
<td>0.00***</td>
<td>0.00***</td>
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<td>0.00***</td>
</tr>
<tr>
<td>KMO</td>
<td>0.60</td>
<td>0.70</td>
<td>0.76</td>
<td>0.78</td>
<td>0.79</td>
</tr>
</tbody>
</table>

Note: N = No. of factors from factor analysis; t-values in bracket. Only priced factors at 1, 5 and 10% significant level are shown. *Significant at 10% level. ** Significant at 5% level. *** Significant at 1% level.

(1983), based on United States stock market, only four factors were present. Whereas the findings are compatible with Lim and Ariff (2005) and Azhar and Mohammad Ali (2006) researches for Malaysian stock market. However, the evidence points out financial and
Table 3. Factor analysis and cross-sectional regression of average returns against factor scores coefficients - second sub period.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>145 Individual securities</th>
<th>20 Portfolios</th>
<th>15 Portfolios</th>
<th>10 Portfolios</th>
<th>5 Portfolios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total variance explained</td>
<td>86%</td>
<td>68%</td>
<td>61%</td>
<td>60%</td>
<td>72%</td>
</tr>
<tr>
<td>No. of common factors</td>
<td>23</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>No. of the priced factors</td>
<td>14</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>$\lambda_1$</td>
<td>0.59*** (3.53)</td>
<td>4.60*** (5.40)</td>
<td>16.68*** (2.72)</td>
<td>52.70*** (24.94)</td>
<td>75.10*** (7.92)</td>
</tr>
<tr>
<td>$\lambda_2$</td>
<td>2.92*** (27.59)</td>
<td>16.24*** (18.78)</td>
<td>6.76*** (2.96)</td>
<td>6.38*** (3.05)</td>
<td>78.61*** (23.44)</td>
</tr>
<tr>
<td>$\lambda_3$</td>
<td>0.48*** (4.78)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>10.38*** (4.90)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_4$</td>
<td>0.65*** (3.31)</td>
<td>16.31*** (17.90)</td>
<td>20.38 (8.94)</td>
<td>10.38*** (4.90)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_5$</td>
<td>0.44*** (4.09)</td>
<td>3.25*** (3.54)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_6$</td>
<td>0.35*** (3.24)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>20.38 (8.94)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_7$</td>
<td>0.57*** (4.76)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>20.38 (8.94)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_8$</td>
<td>0.87*** (7.21)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>20.38 (8.94)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_9$</td>
<td>0.42*** (4.29)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>20.38 (8.94)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_{10}$</td>
<td>0.48*** (3.17)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>20.38 (8.94)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_{11}$</td>
<td>0.41*** (4.22)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>20.38 (8.94)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$\lambda_{12}$</td>
<td>0.65*** (6.05)</td>
<td>6.91*** (8.27)</td>
<td>15.74*** (6.67)</td>
<td>20.38 (8.94)</td>
<td>20.38 (8.94)</td>
</tr>
<tr>
<td>$d_{Financial}$</td>
<td>0.41 (0.72)</td>
<td>-5.90**(-2.20)</td>
<td>-0.0021 (-0.0003)</td>
<td>-12.59*(-2.64)</td>
<td>6.04(0.79)</td>
</tr>
<tr>
<td>$d_{Economical}$</td>
<td>-0.70 (0.44)</td>
<td>0.97 (0.34)</td>
<td>-0.78 (-0.11)</td>
<td>-0.39 (-0.06)</td>
<td>-11.34 (-1.15)</td>
</tr>
<tr>
<td>F</td>
<td>36.57</td>
<td>115.54</td>
<td>23.48</td>
<td>159.66</td>
<td>159.17</td>
</tr>
<tr>
<td>Sig.F</td>
<td>0.00***</td>
<td>0.00***</td>
<td>0.00***</td>
<td>0.00***</td>
<td>0.00***</td>
</tr>
</tbody>
</table>

Note: N = No. of factors from factor analysis; t - values in bracket. Only priced factors at 1, 5 and 10% significant level are shown. * Significant at 10% level. ** Significant at 5% level. *** Significant at 1% level.

Results of the factor structure of the Iranian economy

The objective here is to identify set Iranian macroeconomic variables that represent the Iranian economy that can explain equity returns on the TSE. Thirteen macroeconomic variables that covered a wide spread of economic process and selection of the economy were analyzed. The overall results from the principal component analysis shows the thirteen macroeconomic variables were grouped into four, five and four factors for full, first sub-period and second sub-period, respectively. In the full period the first factor explained highest variance of Iranian economy. The most important factors are money variables in the 17-year whole period. The most important factor in the first sub-period is factor one that includes the variables related to oil. Oil price is the most important factor in Iranian economy in this period. However, trade balance is most important of the first factor in second sub period. It is appear that Money variables are most important variables that explained fluctuation in Iranian economy. Consistent are the results in Kim and Wu (1987), returns on securities are influenced by various macroeconomic activities. For instance, Roll and Ross (1980) and Chen et al. (1986), have pointed out that the common factors are related to the fundamental economic aggregates (Table 4).

Results of canonical correlation analysis

Here, we have examined the relationship between the principal component scores of non oil based stock returns that obtained from cross-sectional regression and principal component of macroeconomic variables that extracted from factor structure of Iranian economy. This
### Table 4. Identification of the macroeconomic variables grouped by the factor loadings.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Full period</th>
<th>First sub-period</th>
<th>Second sub-period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor 1</strong></td>
<td>Money supply (M2), money supply (M1), central bank reserves, trade balance, exchange rate, oil price</td>
<td>Oil price, export of crude oil, crude oil production, consumer price index</td>
<td>Trade balance, central bank reserves, volume of stock transaction, exchange rate, TEPIX serve</td>
</tr>
<tr>
<td><strong>Factor 2</strong></td>
<td>Consumer price index, GDP crude oil production</td>
<td>TEPIX, central bank reserves, GDP</td>
<td>Money supply (M2), money supply (M1), consumer price index, GDP</td>
</tr>
<tr>
<td><strong>Factor 3</strong></td>
<td>TEPIX, volume of stock transaction</td>
<td>Trade balance, profit rate proxy, exchange rate</td>
<td>Oil price, crude oil production, export of crude oil</td>
</tr>
<tr>
<td><strong>Factor 4</strong></td>
<td>Export of crude oil, profit rate proxy</td>
<td>Money supply (M2), money supply (M1)</td>
<td>Profit rate proxy</td>
</tr>
<tr>
<td><strong>Factor 5</strong></td>
<td>-</td>
<td>Volume of stock transaction</td>
<td>-</td>
</tr>
</tbody>
</table>

### Table 5. Canonical correlation analysis in the periods.

<table>
<thead>
<tr>
<th>Stock market returns</th>
<th>Macroeconomic variables</th>
<th>Full period</th>
<th>First sub period</th>
<th>Second sub period</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSMR</td>
<td>Shared variance (%)</td>
<td>Redundancy (%)</td>
<td>FSMR</td>
<td>Shared variance (%)</td>
</tr>
<tr>
<td>53 IS</td>
<td>FSMR3</td>
<td>9</td>
<td>1.8</td>
<td>F Macron4</td>
</tr>
<tr>
<td>20 Port</td>
<td>FSMR2</td>
<td>22</td>
<td>2.6</td>
<td>F Macron4</td>
</tr>
<tr>
<td>15 Port</td>
<td>FSMR3</td>
<td>25</td>
<td>3.7</td>
<td>F Macron2</td>
</tr>
<tr>
<td>10 Port</td>
<td>FSMR2</td>
<td>50</td>
<td>5.6</td>
<td>F Macron2</td>
</tr>
<tr>
<td>5 Port</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>53 IS</td>
<td>FSMR5</td>
<td>14</td>
<td>2.5</td>
<td>F Macron2</td>
</tr>
<tr>
<td>20 Port</td>
<td>FSMR1</td>
<td>20</td>
<td>3.6</td>
<td>F Macron3</td>
</tr>
<tr>
<td>15 Port</td>
<td>FSMR3</td>
<td>20</td>
<td>3.4</td>
<td>F Macron1</td>
</tr>
<tr>
<td>10 Port</td>
<td>FSMR1</td>
<td>50</td>
<td>7.2</td>
<td>F Macron3</td>
</tr>
<tr>
<td>5 Port</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note: F Macron2 refers to Macroeconomic variables 2, F Macron3 refers to Macroeconomic variables 3, F Macron4 refers to Macroeconomic variables 4, F Macron5 refers to Macroeconomic variables 5.*
thesis employed different size of non-oil based individual securities and portfolios in 17-year full period, first sub-period and second sub-period. Different sample size of portfolios is used to see and compare between the results. In full period the source of systematic risks by using fifty three individual securities and different size of portfolios consist of export of the crude oil and profit rate proxy. Before the financial crisis in first sub period trade balance, profit rate proxy and exchange rate are source of systematic risks in the TSE. After the financial crisis oil price, crude oil production and export of crude oil are source of systematic risk in second sub-period. The results illustrates that the value of standardized variance of the principal component scores of stock market returns explained by their own canonical variate and the opposite of canonical variate (redundancy) are increased by reducing the number of samples in most of the cases in the all periods. However, these results are not supported in the standardized variance of the principal component scores of macroeconomic variables (Table 5).

Conclusions

The results suggest validity but weak applicability of APT in Iran over the study period. This can be seen in the results of the factor analysis which generally found one to two factors being priced over the periods. The results suggest that maximum 86% of variance was explained by the factors. The 14% of variance is remained without any explanation. So, there is arbitrage opportunity in the TSE that works in economy under the sanctions. This research found out that the thirteen macroeconomic variables which were used did poorly explaining the excess returns of the samples and all of them were not affected stock market returns in different sample size and periods. In non oil based companies, economical and financial dummy variables are significant at least of the samples compare to whole companies. It means that the financial and economical sanctions are not affectively the volatility of non oil stocks returns. Thus, financial and economical sanctions have more affect on oil industry rather than non oil industry in Iran. The conclusion is that the non-oil base companies’ returns are more stable. Due to the financial and economical sanctions the investment decision in Iran is complicated because the risks are difficult to evaluate and often non-quantifiable. The country risk is huge; transactions are subject to considerable financial scrutiny.

REFERENCES

Full Length Research Paper

Utilisation of budgets in clothing small medium and micro enterprises (SMMEs) within the Cape Metropole

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According to popular literature, the risk of business failure is described as high amongst small medium and micro enterprises (SMMEs), especially considering that businesses constantly deal with future uncertainties. These uncertainties are amplified by the constant threat of yet another recession looming in the future. Considering that each business owner’s main objective is to generate profits for growth, failure to plan for future endeavours may compromise the goals of the business; which often leads to financial disaster. Budgeting, however, is an important factor for consistency and growth in any business, however, the perception was formed that SMMEs do not make adequate use of budgets in order to make effective decisions. The main objective of this study was to determine to what extent SMMEs make adequate use of budgets to make effective business decisions. This empirical research study was regarded as descriptive research and fell within the ambit of the positivistic research paradigm. The study was also regarded as quantitative in nature and data was collected by means of distributing 30 questionnaires to owners and/or managers of clothing SMMEs in the Cape Metropole. The sampling method chosen was non-random sampling, specifically purposive sampling, with the main intention to obtain rich data. All respondents were assured of confidentiality and anonymity, and all responses were voluntary in nature. Relevant findings were made from descriptive statistics, which were followed by recommendations, which aimed to mitigate and/or solve the identified research problem. A final conclusion was also drawn on the aforementioned phenomenon.

Key words: Small and medium micro finance (SMME), budgets, planning tools, business failure, performance measures.

INTRODUCTION

The South African National Small Business Enabling Act (Act 102 of 1996) defines a small business as: a separate and distinct business entity, including cooperative enterprises and non-governmental organisations, managed by one or more owners which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or subsector of the economy. Moreover these entities can be classified as a micro-, very small, small or a medium enterprise (South Africa, 1996, cited by Ladzani and Netswera, 2009).

According to Cupido (2002), SMMEs are described as separate and distinct entities without subsidiaries or branches, managed by its respective owners. Nieman and Bennett (2002), explains an entrepreneur as a person who sees an opportunity in the market, gathers resources and creates and grows a business venture to satisfy these needs. He or she takes the risk of the venture and is rewarded with profit if it succeeds.

The risk of business failure is high amongst SMMEs. International research reveals that the major causes of business decline and failure are internal factors. This is especially due to a lack of financial control, poor cash flow management, high gearing levels, inadequate management competence, poor production planning and control, and insufficient marketing. These internal inadequacies rather than external factors such as economic and competitive changes are the main causes of failure (Cupido, 2002).
Macleod and Terblanche (2004), aver that budgets are the foundations and the concrete manifestations of a business plan in action. Failure by management to maintain proper, frequently updated and reviewed budgets, may lead to a business that remains small and stagnant. The decision to start one's own business should be made with the full understanding of the risks involved. A small business owner should anticipate problems to reduce the possibility of loss, and ultimately increase the chances of success (Hatlen, 1997). Cupido (2002), also maps to the fact that the risk of business failure is high amongst SMMEs. International research reveals that the major causes of business decline and failure are internal factors. This phenomenon is especially due to the lack of financial control, poor cash-flow management, high gearing levels, inadequate management competencies, poor production planning and control, and insufficient marketing. These internal inadequacies, rather than external factors such as economic and competitive changes, are regarded as the main causes of failure.

Nieman and Bennett (2002) viewed that management tools are essential for decision-making, problem-solving and effective management, however, limited entities make use of such management tools (Macleod and Terblanche, 2004). According to Stokes and Wilson (2006), small businesses differ greatly in their approach to the provision of accounting information, and the use of forecasts and budgets for planning and control of the business. It is generally the case that entrepreneurial small firms make much greater use of forecasted financial information than more passive firms.

Nieman et al. (2003) agreed that possible managerial success factors that are satisfied with these measures which include: planning, knowledge of competitors, quality of work, financial insight and general management.

One of the most important planning and control measures is the budget. A complete budgetary system can therefore lead to effective planning, provided it is based on realistic assumptions (Nieman and Bennett, 2002). Budgets are essential to the success of every business entity. Unfortunately, only a select group of small businesses make use of them (Macleod and Terblanche, 2004).

LITERATURE REVIEW

Overview of small medium and micro enterprises (SMMEs)

According to Stokes and Wilson (2006), in the 1950s and 1960s small business were written off as out of date forms of economic activity. By the late 1970s and 1980s, they were hailed as the ‘saviors’ of Western-economies and by the 1990s SMEs were recognised as the key to sustainable employment.

The Global Entrepreneurship Monitor (GEM) report of 2007, noted that entrepreneurship in low and middle income countries is mostly need driven, thus people are starting businesses despite little or no business experience. Only 3.6% of entrepreneurial businesses in South Africa show growth potential and most do not become employers, indicating that a low entrepreneurial success rate is a problem (Admin, 2010).

Tshabalala and Rankhumise (2011) explained that since 1995, the government of South Africa has been actively promoting small businesses in order to achieve the objectives such as of economic growth through, employment generation and income redistribution. Furthermore, Tshabalala and Rankhumise (2011) stated that more than 80% of all businesses in South Africa are described as small businesses.

Sustainability is a vital issue for businesses. The small business needs to develop a corporate strategy that responds to stakeholder’s expectations; whilst ensuring long-term performance and profitability (Management for strategic business ideas, 2007).

Olawale and Garwe (2010) are of the opinion that the creation and sustainability of small business are vital to the economic prosperity of South Africa, as they reduce the risks of economic stagnation.

Failure of small medium and micro enterprises (SMMEs)

According to Mmbengwa et al. (2011), small businesses are more likely to have a high failure rate as opposed to larger enterprises. Olawale and Garwe (2010) noted that an estimated 75% of small businesses in South Africa fail within their first three years of existence. In addition, Von Broembsen et al. (2005), cited by Olawale and Garwe (2010), states that the probability of a new SMME surviving beyond 42 months is less likely in South Africa than in any other GEM sampled country.

Viljoen (2011) explains that in the event that a business loses control of its finances, it loses control of the entire business. Controlled finances provide companies with relevant information to make meaningful decisions. Mmbengwa et al. (2011) mentioned that small business failure can be attributed to internal factors such as lack of skills or poor strategic planning, including external factors such as market conditions. According to Martin and Staines (2008), cited by Olawale and Garwe (2010), the inadequate utilisation of managerial tools is the main reason why new firms fail. Parker and Illetschko (2008) noted that the one aspect that distinguishes successful small businesses from other entities is that they are able to make the best of available resources.

Financial performance measures

Stokes and Wilson (2006) are of the opinion that small
businesses differ greatly among others in their approach to utilising accounting information, forecasts and budgets for planning and controlling purposes. Every successful enterprise starts with a business model that works. This is a plan that describes what you intend selling, for how much, and what it will cost to produce and deliver to the market (Steyn et al., 2008).

Drury (2008) explains that a budget is a financial plan for implementing the various decisions that management has made. The budgets for all the various decisions are expressed in terms of cash inflows and outflows, and sales revenues and expenses. These budgets are merged together into a single unifying statement of the organisation’s expectations for future periods. This statement is known as a master budget. The master budget consists of a budgeted profit and loss account, cash flow statement and balance sheet. The budgeting process communicates to everyone in the organisation the part that they are expected to play in implementing management’s decisions (Drury, 2008).

**Budget benefits**

Reeve et al. (2009) agreed that budgets play an important role for organisations of all sizes and forms. It involves establishing specific goals, executing plans to achieve the goals and periodically comparing actual results with the goals. Drury (2008) further explains that budgets with a high probability of being achieved are widely used in practice. They provide managers with a sense of achievement and self-esteem which can be beneficial to the organisation in terms of increased levels of commitment and aspirations.

**RESEARCH DESIGN**

This empirical research study was regarded as descriptive research and fell within the ambit of the positivistic research paradigm. This refers to research where one observes and measures a specific study from an objective point of view (Welman et al., 2005).

**Data collection**

Data was collected by means of distributing 30 questionnaires to owners and/or managers of clothing SMMEs in the Cape Metropole. 40 small businesses were visited by research teams at specified locations, which included the Northern Suburbs, Southern Suburbs, as well as the City bowl district. All respondents were assured of confidentiality and anonymity, and all responses were voluntary in nature.

**Sampling and analysis**

The study was also regarded as quantitative in nature. It is the collection and analysis of numerical data to be applied in the study. This approach was chosen since it is more practical and less time consuming. The sampling method deployed was that of non-random sampling, specifically purposive sampling, with the main intention to obtain rich data. Relevant findings were made from descriptive statistics, which were followed by recommendations, which aim to mitigate and/or solve the identified research problem. A final conclusion was also drawn on the aforementioned phenomenon.

**RESEARCH FINDINGS AND DISCUSSION**

The first question analysed was the period that small businesses have been in existence. The responses were as follows: The average period was 7.5 years, the maximum period 23 years and the minimum period 6 months. When asked as to the position held in the company, 52% answered “manager”, 28% “owner”, 17% “owner/ manager” and 3% “other”.

All business owners/managers consulted regarded their business as “successful”. This opinion is closely linked to the number of years these businesses have been in existence, even though previous studies had shown that small businesses tend to fail within the first three years. Analysing the criteria for business success, the following options were given: personality, attitude, passion for business, passion, being opportunistic and being goal oriented. The majority of respondents indicated that “being goal orientated” and “passionate” are the most popular criteria at 79 and 83%, respectively.

Entrepreneurial personality traits were investigated, with the following as possible options: extrovert, introvert, realistic, idealistic, emotional, logical, organised, spontaneous and passionate. A staggering 71% of respondents indicated that entrepreneurs should be “organised”. 59% felt they should be “realistic”, 54% “logical”, 45% “idealistic” and 36% indicated that “spontaneity” is almost often of essence. Surprisingly, 41% of respondents indicated that being an “introvert” or “extrovert” was of very little importance to entrepreneurial personality traits.

When the question was posed on the helpfulness of budgets, most respondents were of the opinion that the use of budgets range from “helpful” to “very helpful” in the daily operations of their businesses. In our analyses, we discovered that businesses make long term decisions based on the following budgets: sales budgets – “almost always”, overhead budgets – “often”, balance sheet – “sometimes” and direct labour budget – “very little”. A tabular depiction of the perception of budgets is shown in Table 1.

In terms of short term decisions, sales budget – “almost always”, selling and admin budget – “often”; overheads – “sometimes” and production budget – “very little”. A tabular depiction of the ‘utilisation’ of relevant financial tools, with regards to decision-making is given in Table 2.

Lastly, the accounts considered for business decisions were examined. 76% indicated the “sales” account as the account of greatest importance, 52% “inventory”, 41% “wages/ salaries” and 36% “bank”. It is rather questionable that respondents indicated the following...
accounts as of very little importance for business decisions: 43% “debtors”, “fixed assets”; and 39% for “creditors” and “tax”.

Conclusions

The prospect of business failure should serve as a warning to owners and managers. According to Drury (2008), budgets serve a number of useful purposes, they include: planning annual operations; coordinating the activities of the various parts of the organisation and ensuring that the parts are in harmony with each other; communicating plans to the various responsibility centre managers; motivating managers to strive to achieve the organisational goals; controlling activities and evaluating the performance of managers.

Budgeting systems are not a “one size fits all” solutions but must adapt to the underlying business conditions (Reeve et al., 2009). Owners and managers alike, responsible for the daily operations of small businesses, need to be aware of the vast benefits of implementing budgets in their various operations. By highlighting adequate budgeting, small businesses will be equipped with a clearer and more comprehensive understanding of these planning tools, thus creating large scale employment opportunities.

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Efficient human resource deployment technique in higher education: A standpoint from Malaysia

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Employability of graduates is dependent on the graduates’ possession of relevant academic qualifications, skills and other attributes needed by the industry. The purpose of this research is to identify the gap between important attributes that graduates of Higher Education Institutions should exhibit and their actual performance when they are employed in industry. The dimensions of the attributes and the performance of these graduates are considered in four broad areas, namely knowledge, skills, abilities and personality. The results show that graduate performance has failed to meet managers’ perceptions of the attributes that should be possessed by these graduates.

Key words: Higher education institutions, curriculum design, important-performance analysis.

INTRODUCTION

The need to improve the employability skills and attributes of the workforce has been an issue across the nation. It is of major concern that many graduates do not have the right combination of skills and personal attributes required by the employers, even though some may possess excellent academic qualifications (Alam, 2009a). Hence, they are unable to secure employment which subsequently contributes to an alarming number of unemployed graduates. According to Minister of Higher Education Malaysia, Y.B. Dato’ Seri Mohamad Khaled Nordin (2009), 24% of Malaysian graduates remained unemployed six months after their convocation.

Higher Education Institutions (HEIs) are the recruiting grounds for numerous industries in search of future employees. Employers often develop long term relationships with those HEIs when they have consistent success at recruiting young executives who have the right combination of skills and personal attributes to contribute to their organizations (Alam, 2009b). However, over recent years, employers have complained that graduates from these HEIs are not able to meet their expectations in the current volatile and dynamic economic climate. Universities are urged to ensure that they produce employable graduates who are able to compete in the employment market (Moreau and Leathwood, 2006; Harvey, 2000).

As HEIs are the final setting before the graduates enter the workforce, HEIs are often blamed for not providing graduates with the relevant skills and capabilities. Recognizing their critical roles, HEIs have been actively involved in research and academic discussions to address the issue of unemployed graduates and to provide recommendations and action plans to improve the quality of graduates. Industries also demand HEIs make their curriculum more relevant to the current situation in order to avoid a mismatch in regard to graduate quality and skills. Thus, collaboration between education providers and industries is strongly encouraged to reduce the gap between the graduates’ abilities and the requirements of the industries (Tenth Malaysian Plan, 2011-2015).

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Abbreviations: HEIs, Higher education institutions; KPI, key performance indicator; IPA, importance-performance analysis.
Since there is a growing concern about the employability skills of graduates, this study takes on the challenge to investigate the employability skills possessed by graduating students in HEIs and to determine to what extent graduating students would be hired by employers. It is also in the interests of this research to study the extent to which graduates now possess the ‘soft skills’ with which universities have been told to equip their graduates (Singh and Singh, 2008). Thus, the objective of this study is to gauge the gap between important elements of HEIs graduate attributes and their performance when they are employed in industry. The dimensions of attributes and the performance of these graduates are considered in four broad areas namely knowledge, skills, abilities and personality (KSAP) (Salina et al., 2010c).

THEORETICAL BACKGROUND

The study discussed graduates’ attributes from the perspective of HEIs resource deployment and HEIs’ collaboration with industries. The related theories used in this study are a resource-based view, alliance theory and demand and supply theory.

Resource-based view

The continuity of company success is mainly a function of its internal and unique competitive resources (Penrose, 1959). This argument was supported by Wernerfelt (1984), Barney (1991) and Teece et al. (1997) who believe that a company needs to emphasize internal aspects of the organizations. Companies perform well and create value when they implement strategies that respond to market opportunities by exploiting their internal resources and capabilities. The resource-based view suggests that companies can earn sustainable supra-normal returns if, and only if, they have superior resources. Companies’ resources include all tangible and intangible assets such as capabilities, company processes, company attributes, information, knowledge, physical structures, etc. that are controlled and owned by a company and that enable it to implement strategies for improved efficiency and effectiveness which lead to improved company performance (Daft, 1986; Jones, 2007; Wernerfelt, 1984).

Capability is the capacity to perform a task or activity that involves complex patterns of co-ordination and co-operation between human capital and resources (Amit and Schoemaker, 1993; Grant, 1991). The capabilities might include superior customer service or high quality manufacturing, know-how that can be traded (e.g. patents and licenses), etc. These resources and capabilities are known as strategic assets (Amit and Schoemaker, 1993; Marr and Roos, 2005) and must be embedded in the end-products or services that create value to the customers. Resources themselves never create value; value is created from the services these resources can render (Penrose, 1959). HEIs’ capability in creating and designing unique curriculum development will produce a competitive workforce that can meet industry needs. They need to deploy their resources according to industry needs and requirements.

Alliance theory

In order to produce a competitive workforce, HEIs need to have a close and strong alliance with industries. They need to create alliances with industry practitioners in order to get information on current industry requirements and needs. Forming alliances is viewed as a means of acquiring more resources and capabilities that are expensive to develop internally, or that are not readily available in the local market place. The examination of alliance theory indicates that it has, over the years, evolved from a descriptive notion into a theoretically anchored concept (Contractor and Lorange, 1988; Kogut, 1988).

With the decision to collaborate comes the issue of partner selection (Trim, 2003). Selecting an appropriate partner, whose objectives are similar to the selector, is a very intensive task but, if it is carried out correctly, will ensure a higher quality and longer lasting relationship. Decision makers must have information and knowledge about partners’ objectives, finances, resources, skills, processes and culture. Legal knowledge is needed to understand the ramifications of aligning with a particular organization and industry knowledge is also important when selecting partners (Rich, 2003).

According to Elmuti and Kathawala (2001), partner selection in an alliance is the main contributing factor to the success of the alliance. This can be attained through collaborative links between competent partners seeking mutually beneficial business results. The term “competent partners” relates to the partners’ strategies, objectives and goals (Elmuti and Kathawala, 2001). Partners selected should leverage the strengths of the other partner. Partnerships tend to be more effective if the partners share similar goals, have comparable products or service lines, share similar cultures and can help fill strategic gaps in either capabilities or market offerings (Rich, 2003). An alliance must be organized in a way to facilitate success for the parties involved. It must be the partners’ intention that the alliance will succeed through speed, adaptation and facilitated evolution (Elmuti and Kathawala, 2001). Ideal partners have compatible objectives, complementary resources and skills, organizational “fit” in terms of cultures and processes, and a willingness to ally with each other (Rich, 2003). Thus, HEIs need to collaborate closely with industry practitioners in order to enhance graduates’
A discrepancy between industry expectations of its workforce and the universities’ capacity to produce employable graduates will always exist. Industry is the first to be exposed to new technology and innovations and, therefore, sets new and higher standards for its employees. Universities are not at the forefront of these advances and therefore struggle to keep abreast of these new developments. Consequently, their curriculum is not up to date with industry expectations. Fleming and Soborg (2010) highlighted this mismatch among the main stakeholders in the Malaysian higher education sector. These employment environment dynamics will always continue to persist and, therefore, continue to hinder the quest for equilibrium in the demand and supply of manpower.

INDUSTRY PERSPECTIVE ON GRADUATES’ CAPABILITY

Nicholson and Cushman (2000) found a difference in perception between industry participants and educators when ranking attributes for success in the retailing field. They concluded that HEIs need to be careful not to dwell on cognitive skills at the expense of affective skills such as ‘leadership’ and ‘decision making’ which may be more important for long term success in retail. Nowadays, employers are concerned with graduates’ skills, where ‘graduate skills’ are more important in the recruitment process than the graduates’ academic performance (Harvey, 2000). Basically, employers want graduates who are equipped with interactive skills, personal skills (Harvey, 2000) and generic skills (Hager et al., 2002). This finding has also been supported by Purcell et al. (2002) who discovered that, for some employers, a degree may represent nothing more than a minimum requirement. Hence, according to Candy et al. (1994), HEIs have a leadership role in producing graduates with skills for continuing lifelong personal and professional development.

The Malaysian employers’ consensus is that Malaysian graduates are well trained in their areas of specialization but unfortunately lack the ‘soft skills’ (Nurita et al., 2004). This ‘deficit’ in graduate skills has also been acknowledged by the United Kingdom’s government with respect to its graduates (Dickinson, 2000). Lawrence (2002) added that America is also experiencing the same problem. Birrell (2006) reported in his study that of 12,000 students at Monash University in Australia, it showed that more than one-third of foreign students in Australian universities, where 24% of whom are Malaysian students, are not proficient in English. The study also noted that although graduates had sufficient command of language in managing their day-to-day activities, they were still not competent enough to engage in an intellectual discussion.

According to Nurita et al. (2006), Malaysian employers...
are searching for graduates who are balanced, with good academic achievements and possessing 'soft skills' such as communication, problem solving and interpersonal skills and the ability to be flexible. There are few views who believe that people with good "soft" skills are born with them; as such these skills are part of their personality traits. However, Hager et al. (2000) found in their research that employees are able to improve their soft skills through their experiences and practices. This is due to the fact that these "soft skills" are the foundation skills that apply across the board; no matter what job the employee is performing (Lawrence, 2002). They need to equip themselves with hard skills as well as soft skills in this emerging global economy.

GRADUATE EMPLOYABILITY IN MALAYSIA

Employers are looking for a more flexible, adaptable workforce as they themselves seek to transform their companies into more flexible and adaptable entities in response to changing market needs. In the year 2005, the Human Resources Minister of Malaysia highlighted that 30,000 Malaysian graduates had only managed to get casual and temporary work, such as, cashiers and restaurant workers because of their poor English proficiency. This factor hinders graduates in becoming better in their jobs, thus reducing their chances of better career prospects, especially in getting jobs that are relevant to their career training.

Chang (2004) reported in his paper the reason graduates are unemployed is that they do not have the right degree. Some graduates with specific qualifications are already abundant in the market, whereas Engineering and other Science degree graduates are still in high demand. Another reason is that graduates with a degree no longer automatically qualify for their first job. Instead, graduates who possess the greatest knowledge and skills in their study domain get hired first.

With a competitive business world, computerization makes job performance measurement very transparent. Managers will only want to hire people who can contribute to team success. Proficiency in English, an ability to present ideas, explain issues and problems, to speak up in a constructive manner, to resolve problems, to understand issues and problems faced by company and to come up with workable solutions to problems, are all good communication and interpersonal skills sought by employers (Chang, 2004). Thus, an employee is expected to contribute on many fronts from day one of being employed.

A Malaysian employment agency namely JobStreet.com conducted a survey on graduate unemployment rate in year 2005. The survey was conducted on 3,300 Human Resource personnel and bosses. Among the factors contributed to graduate unemployment are; weakness in English (56%), poor social etiquette (36%), demanding too much pay (32%), degrees not relevant (30%), fresh graduates too choosy (23%), and no vacancies (14%). The weakness in English and poor social etiquette are the top reasons for graduates being unemployed. These findings show that Malaysian graduates are unemployed, not because they are unintelligent, but rather because most of them lack of skills required by the employers.

The Malaysian Ministry of Higher Education has implemented various initiatives to alleviate the problems of unemployed graduate over the last few years. Among the initiatives are the introductions of soft skills modules to embed communication skills, leadership and team building as well as reporting skills into the graduate's curriculum of studies. In addition, basic entrepreneurship modules, internship or industrial training program, and collaborative programs with the relevant industries have been introduced (Khaled, 2009).

The studies carried out by the Ministry of Higher Education on graduate employability from 2006 until 2009 has shown a significant improvement on their employability. In 2006, the unemployment rate among graduates was at a high 31%; in 2007, the unemployed graduate rate had dropped to 27%. The unemployment rate among graduates was further improved with a percentage point of 24% in 2008 (Khaled, 2009). In 2009, the percentage remains the same as in 2008, where 24% of graduates remained unemployed (Khaled, 2009). The percentage of unemployed showed an improvement and progress in getting more graduates employed in the job market. This is a result of a policy created by the Malaysian Ministry of Higher Education to produce graduates who are highly relevant to the job market and possess the required skills, competencies and attitude needed to succeed in their world of work.

GRADUATES ATTRIBUTES

The key performance indicator (KPI) for HEIs is employability of the graduates (Morley, 2001). In order to achieve the KPI, HEIs are urged to ensure that they are able to produce employable graduates that meet the needs of the industry (Moreau and Leathwood, 2006; Harvey, 2000). In this study, individual employability is defined as graduates being able to demonstrate the attributes to obtain jobs. Hillage and Pollard (1998) stated that employability of the graduates depended on the graduates’ knowledge, skills and aptitudes. Harvey and Howard (1999) suggested in Treleavan and Voola (2008) that graduates’ success in their jobs depends more on graduate attributes than on narrow discipline specific degrees.

Trauth et al. (1993) added that there is an "expectation gap" between industry needs and academic preparation. HEIs must work together to close this gap where HEIs need to place more emphasis on the integration of
technologies, applications, data and business functions and less on traditional and formal system development. Candy et al. (1994) noted that HEIs have an important role in producing graduates who are not only attuned to the needs of the industry but also equipped with the skills to afford them continuing lifelong personal and professional development.

Raybould and Sheedy (2005) noted that for graduates to be attractive to employers, it is important that they are able to show evidence of having the ability to cope with uncertainty, the ability to work under pressure, demonstrate action-planning skills, communication skills, information technology skills, team work, readiness to explore and create opportunities, self confidence, self management skills, and a willingness to learn. In addition, Baxter and Young (1982) have indicated that employers need entry level workers who are dependable and trustworthy, have basic communication, thinking and problem solving skills, have the desire to learn and advance, the ability to work as part of a team and possess a proper attitude.

According to Noe et al. (2007), the four main dimensions such as knowledge, skills, abilities and "others" (KSAO) are used to look at the qualities of employees when performing their tasks. Knowledge refers to factual or procedural information that is necessary for successfully performing a task. Knowledge can be classified into tacit and explicit knowledge (Nonaka and Takeuchi, 1995; Polanyi, 1966). Polanyi (1966) described tacit knowledge as knowledge that is difficult to express and is usually transferred by demonstration rather than description, while explicit knowledge is easily written down and easier to communicate and transfer between individuals.

Skills refer to an individual's level of proficiency at performing a particular task or the capability to perform a job well. Skills can be divided into technical elements and behavioural elements (Noe et al., 2007). Technical elements measure "hard" technical skills while behavioural elements measure "soft" skills which include the attitudes and approaches applicants take to their work, such as the ability to collaborate on team projects.

Ability refers to an individual's capacity to perform the various tasks in a job. It is a current assessment of what one can do. An individual's overall abilities are essentially made up of two sets of factors; intellectual and physical abilities (Robbins and Judge, 2009). Intellectual abilities are those needed to perform mental activities like number aptitude, verbal comprehension, perceptual speed, inductive reasoning, deductive reasoning, spatial visualization and memory, while physical abilities relate to tasks demanding stamina, dexterity, strength and similar characteristics.

For "others", the discussion is focused on Big Five Personality traits (Gibson et al., 2006; Kreiner and Kinicki, 2008; Robbins and Coulter, 2009; Robbins and Judge, 2009) or Global Factors Personality (Russell and Karol, 1994). They comprise openness, conscientiousness, extroversion, agreeableness and emotional stability. Openness is an appreciation of art, emotion, adventure, unusual ideas, curiosity, and a variety of experiences. Conscientiousness is a tendency to show self-discipline, act dutifully, and to aim for achievement. It is planned rather than spontaneous behavior. Extroversion is energy, positive emotions, urgency, and the tendency to seek stimulation in the company of others. Agreeableness is a tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others. Emotional stability is calm, focused, and self-confident in handling stress as opposed to insecure, anxious, and depressed.

**IMPORTANCE-PERFORMANCE ANALYSIS (IPA)**

The importance-performance concept is based on multi-attribute models. This technique identifies the performance of an attribute that can be changed without affecting the importance of the attribute (Kitcharoen, 2004). According to Nale et al. (2000) a particular application of the technique starts with an identification of the attributes that are relevant to the situation selected to be investigated.

This approach, also known as quadrant analysis, was introduced by Martilla and James (1977). In their study of customer satisfaction they focused on pinpointing those quality and service elements that: a) are most important to customers and/or are likely to make the strongest contribution to overall customer satisfaction and loyalty and b) are in need of improvement because customers' evaluations of the company's performance on these elements are relatively unfavourable (that is, customers are dissatisfied and/or perceive that the company's performance is in need of improvement). By using the central tendency measure such as mean, performance scores are ordered and classified into high or low categories, then by pairing these two sets of rankings, each attribute is placed into one of the four quadrants that will be displayed graphically using an importance-performance matrix as in Figure 1 (Eskildsen and Kristensen, 2006). With little modification, IPA has been applied to a diverse range of contexts including hospital services (Yavas and Shemwell, 2001), tourism management (Wade and Eagles, 2003), education (Nale et al., 2000; O'Neill and Palmer, 2004) and service quality (Ennew et al., 1993; Ford et al., 1999).

The IPA matrix consists of four quadrants; concentrate here, keep up the good work, low priority and possible overkill Oliver (1997). Firstly, the 'keep up the good work' quadrant (high importance, high performance) assumes that all elements or attributes that fall in this quadrant are to be key drivers of consumer satisfaction/preference, and the management's job is to ensure that the organization continues to deliver or perform well in these
areas. Secondly, the ‘concentrate here’ quadrant (high importance, low performance) assumes that all elements or attributes that fall in this quadrant are the key drivers of consumer satisfaction or preference and should be viewed as critical performance shortfalls. It is the management’s responsibility to ensure that adequate resources are allocated to these attributes to improve performance in these areas. These areas are priorities for improvement. Thirdly, the ‘low priority’ quadrant (low importance, low performance) assumes that all elements or attributes are relatively unimportant, such that poor performance should not be given a great deal of priority or attention by management. Finally, the ‘possible overkill’ quadrant (low importance, high performance) assumes that all elements or attributes are relatively unimportant, should be viewed as an area of performance "overkill" and management may want to redirect resources from these elements to high-priority areas in need of improved performance.

MATERIALS AND METHODS

The study was carried out in two phases. Phase 1 involved a focus group session of 10 members whose task was to extract information from managers through a brainstorming session. This session focused on the growing concern among employers about the relevance of the HEIs curriculum in the face of developments in the real world today. The researchers, being the moderators of the focus group, sought unprompted discussion of the issues contributing to graduate unemployment in Malaysia. Using the KSAP (knowledge, skills, abilities and personalities) dimensions (Salina et al., 2010c) as a basis for the study, questions were derived through the focus group interview and specific issues put forward by the group. In Phase 2, the dominant theme(s) emerging from the focus group study were used to establish a questionnaire pertaining to the KSAP dimensions.

Measures

The KSAP dimensions consisted of 11 factors, which included two factors for knowledge dimensions namely explicit and tacit knowledge, two factors for skills dimensions that included hard and soft skills, two factors for abilities dimensions comprised intellectual and physical abilities and five factors for personality dimensions that consisted of conscientiousness, agreeableness, emotional stability, openness and extroversion personalities. The question items used to represent each factor were between 4 and 5. This is in keeping with the thoughts of Hair et al. (2006) who indicated that a minimum of 4 question items is recommended to represent a factor.

Instrument

The questionnaire was divided into two sections. Section A was based on demographic profiles of the respondents while Section B measured the managers’ perceptions of important characteristics and the corresponding performance of those characteristics among the graduates based on the KSAP dimensions. The Likert scale was used to measure respondent opinions. The first attempt was to measure respondent judgements on important characteristics of graduates, where ‘1’ represented extremely unimportant and ‘7’ represented extremely important, followed by a second evaluation of actual performance of these graduates, where ‘1’ represented extremely bad and ‘7’ extremely good. The questionnaire was distributed personally to the managers of all the companies that were listed in the top 1000 Company Directory for completion. This exercise enabled the examination of the gap between the perceptions of managers towards the important characteristics of graduates and their actual performance in terms of their knowledge, skills, abilities and personality.

Sample and analysis

The sample for the study was obtained from the top 1000 Company Directory (Malaysian Top Corporation Directory 2007-2008) which contains comprehensive information on Malaysian companies in a...
wide range of corporate and industrial sectors, ranking them in terms of financial performance and listing the leaders of the respective sectors. This directory was considered to be reputable and reliable in Malaysia. However, there is likely to be a bias in the data as this directory is published annually and, therefore, may not have listed all Malaysian companies eligible to be investigated at the time the data was collected. Given the lack of other official sources of Malaysian companies, at the time of this study, the approach adopted was considered to be valid as there is a well established precedent for researchers to compile databases this way (Glaister and Buckley, 1998, 1994; Hergert and Morris, 1998; Kauser and Shaw, 2004).

Pre-analysis was carried out using factor analysis and reliability analysis. Descriptive analysis was then used to describe the data. The findings were presented in the form of a quadrant analysis. It is important to note that importance measures are direct and self-reported measures and, therefore, could have method bias. Stated methods reflect what a respondent will admit to readily and thus may not reflect fully the importance of attributes that the respondent may not reflect or of which the respondent is not aware. Consequently, stated measures may reflect a social desirability or awareness bias (Bacon, 2003). Another point to consider concerning the stated method is that the attributes may be uniformly rated highly because some respondents rate everything as very important.

RESULTS AND DISCUSSION

Demographic Profile

The respondents’ demographic profile is presented in Table 1. Four hundred and seventy eight (478) completed questionnaires were received representing a 48% response rate. The majority of the graduates were attached to manufacturing companies (53%) followed by service and construction industries with 25 and 13%, respectively. Most of these graduates were employed by companies located in the central region of Peninsular Malaysia (50%). Approximately two thirds of the respondents in the survey were in middle management positions (64%) and the majority of their executive staff was degree holders (45%). Half of the respondents were Malay (57%) and 65% of them were male.

Validity and reliability of the instruments

The survey questions used for this study conformed to the validity requirement. Content validity was established in the development of the graduates’ attributes dimensions. This is because it was based on focus group suggestions and literature review. The feedback and emergent issues regarding graduates’ attributes which included soft and hard skills, communication skills and level of confidence, raised by the focus group were translated into scale items in the questionnaire. Factor analysis was used to establish construct validity for all the scale items of the dimensions employed in this study (Kerlinger and Lee, 2000). All of the items in the dimensions are factor-analyzed and loaded in accordance with prior theoretical expectations. Table 2 presents Kaiser-Meyer-Olkin measure of sampling adequacy (KMO), eigenvalues and percentage of variance for each item under this study. The results of the analysis of data revealed satisfactory outputs for further analysis.

The reliability of the data was verified using Cronbach alpha, where the closer the Cronbach alpha is to 1, the higher the internal consistency reliability (Sekaran, 2000). The alpha coefficients for this study are all above 0.70 and were considered to be reliable (Hair et al., 2006; Nunnally, 1978). Table 3 presents the Cronbach alpha coefficient for each variable.

Importance-performance analysis

A summary of managers’ importance-performance means for 11 scale items is presented in Table 4. The negative gap values between importance-performance indicate that, the graduates’ performances have not met the managers’ perceptions of the importance attributes that should be possessed by these graduates. In other words, graduates from the HEIs were under performing significantly in all attributes rated important by the supervisors and managers.

Figure 2 presents the managers’ importance-performance map. The data used to construct the importance-performance grid was the overall means of importance and performance for all factors which are 6.41 and 5.64, respectively. Two factors fall into the “concentrate here” quadrants (high importance/low performance) which are soft skills and conscientiousness personality. The HEIs need to take immediate action on these graduates’ attributes.

While three factors were located in the quadrant “keep up the good work” (high importance/high performance), and included extroversion personality, emotional stability personality and openness personality. The HEIs only need to maintain their current allocation of resources in developing these factors in the curriculum design of the HEIs. These three attributes are the strength attributes possessed by graduates of the HEIs in the sample, which means that graduates produced by this institution possess good personalities, namely extroversion, emotional stability and openness personality.

The five attributes that fall in the “low priority” quadrant are in relation to hard skills, intellectual abilities, explicit knowledge, tacit knowledge and agreeableness personality. This indicates that these attributes do not require immediate resource allocation as they are performing at the level appropriate to the importance attached to them at the present time. However, the HEIs should hold in reserve resources to cope with a possible change of importance attached to them due to changes in the employment environment in the future.

A physical ability is the only attribute located in the
Table 1. Demographic profile.

<table>
<thead>
<tr>
<th>Items</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of industry</strong></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>53</td>
</tr>
<tr>
<td>Construction</td>
<td>13</td>
</tr>
<tr>
<td>Service</td>
<td>25</td>
</tr>
<tr>
<td>Information Technology</td>
<td>3</td>
</tr>
<tr>
<td>Heavy industry</td>
<td>4</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
</tr>
<tr>
<td><strong>Location of company</strong></td>
<td></td>
</tr>
<tr>
<td>Northern</td>
<td>20</td>
</tr>
<tr>
<td>Southern</td>
<td>16</td>
</tr>
<tr>
<td>Central</td>
<td>50</td>
</tr>
<tr>
<td>Eastern</td>
<td>8</td>
</tr>
<tr>
<td>Western</td>
<td>6</td>
</tr>
<tr>
<td><strong>Type of company</strong></td>
<td></td>
</tr>
<tr>
<td>Holding/parent</td>
<td>55</td>
</tr>
<tr>
<td>Subsidiary</td>
<td>10</td>
</tr>
<tr>
<td>Others</td>
<td>35</td>
</tr>
<tr>
<td><strong>Number of employees</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 20</td>
<td>11</td>
</tr>
<tr>
<td>20 to 50</td>
<td>14</td>
</tr>
<tr>
<td>51 to 150</td>
<td>15</td>
</tr>
<tr>
<td>51 to 500</td>
<td>18</td>
</tr>
<tr>
<td>More than 500</td>
<td>42</td>
</tr>
<tr>
<td><strong>Position at the company</strong></td>
<td></td>
</tr>
<tr>
<td>Top management</td>
<td>25</td>
</tr>
<tr>
<td>Middle management</td>
<td>64</td>
</tr>
<tr>
<td>Lower management</td>
<td>11</td>
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<tr>
<td><strong>Highest qualification held by executive level employees</strong></td>
<td></td>
</tr>
<tr>
<td>Postgraduate degree</td>
<td>41</td>
</tr>
<tr>
<td>Degree</td>
<td>45</td>
</tr>
<tr>
<td>Diploma</td>
<td>12</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
</tr>
<tr>
<td><strong>Highest education level</strong></td>
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</tr>
<tr>
<td>Postgraduate degree</td>
<td>19</td>
</tr>
<tr>
<td>Degree</td>
<td>47</td>
</tr>
<tr>
<td>Diploma</td>
<td>20</td>
</tr>
<tr>
<td>STPM/SPM</td>
<td>13</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
</tr>
<tr>
<td><strong>Number of years experience</strong></td>
<td></td>
</tr>
<tr>
<td>1 to 5 years</td>
<td>34</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>37</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>29</td>
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</table>
Table 1. Contd.

<table>
<thead>
<tr>
<th>Race</th>
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<tbody>
<tr>
<td>Malay</td>
<td>57</td>
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<tr>
<td>Chinese</td>
<td>37</td>
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<tr>
<td>Indian</td>
<td>5</td>
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<tr>
<td>Others</td>
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<table>
<thead>
<tr>
<th>Gender</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>65</td>
</tr>
<tr>
<td>Female</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 2. Summary of factor analyses.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Items</th>
<th>Importance KMO</th>
<th>Eigenvalues</th>
<th>% of variance</th>
<th>Actual Performance KMO</th>
<th>Eigenvalues</th>
<th>% of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Explicit knowledge</td>
<td>0.88</td>
<td>3.79</td>
<td>75.89</td>
<td>0.84</td>
<td>3.67</td>
<td>73.39</td>
</tr>
<tr>
<td></td>
<td>Tacit knowledge</td>
<td>0.83</td>
<td>3.18</td>
<td>79.52</td>
<td>0.83</td>
<td>3.23</td>
<td>80.74</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills</td>
<td>Hard skills</td>
<td>0.86</td>
<td>3.82</td>
<td>76.40</td>
<td>0.85</td>
<td>3.81</td>
<td>76.20</td>
</tr>
<tr>
<td></td>
<td>Soft skills</td>
<td>0.78</td>
<td>3.28</td>
<td>65.52</td>
<td>0.85</td>
<td>3.54</td>
<td>70.87</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abilities</td>
<td>Intellectual abilities</td>
<td>0.84</td>
<td>3.67</td>
<td>73.49</td>
<td>0.84</td>
<td>3.74</td>
<td>74.81</td>
</tr>
<tr>
<td></td>
<td>Physical abilities</td>
<td>0.85</td>
<td>3.33</td>
<td>83.35</td>
<td>0.79</td>
<td>2.72</td>
<td>67.86</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personality</td>
<td>Conscientiousness</td>
<td>0.82</td>
<td>3.79</td>
<td>75.78</td>
<td>0.84</td>
<td>3.86</td>
<td>77.25</td>
</tr>
<tr>
<td></td>
<td>Agreeableness</td>
<td>0.82</td>
<td>3.00</td>
<td>75.07</td>
<td>0.84</td>
<td>3.13</td>
<td>78.19</td>
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<tr>
<td></td>
<td>Emotional stability</td>
<td>0.79</td>
<td>3.22</td>
<td>80.53</td>
<td>0.79</td>
<td>3.21</td>
<td>80.29</td>
</tr>
<tr>
<td></td>
<td>Openness</td>
<td>0.85</td>
<td>3.73</td>
<td>74.58</td>
<td>0.84</td>
<td>3.85</td>
<td>76.93</td>
</tr>
<tr>
<td></td>
<td>Extroversion</td>
<td>0.80</td>
<td>3.26</td>
<td>81.61</td>
<td>0.80</td>
<td>3.24</td>
<td>80.96</td>
</tr>
</tbody>
</table>

Table 3. Reliability statistics for importance and actual performance scale.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Items</th>
<th>Importance</th>
<th>Actual performance</th>
<th>No. of item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Explicit knowledge</td>
<td>0.920</td>
<td>0.909</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Tacit knowledge</td>
<td>0.914</td>
<td>0.920</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills</td>
<td>Hard skills</td>
<td>0.922</td>
<td>0.922</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Soft skills</td>
<td>0.866</td>
<td>0.897</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abilities</td>
<td>Intellectual abilities</td>
<td>0.909</td>
<td>0.915</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Physical abilities</td>
<td>0.933</td>
<td>0.702</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personality</td>
<td>Conscientiousness</td>
<td>0.919</td>
<td>0.926</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Agreeableness</td>
<td>0.888</td>
<td>0.907</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Emotional stability</td>
<td>0.919</td>
<td>0.918</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Openness</td>
<td>0.914</td>
<td>0.925</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Extroversion</td>
<td>0.924</td>
<td>0.921</td>
<td>4</td>
</tr>
</tbody>
</table>

“possible overkill” quadrant. This requires the HEIs to immediately remove resources allocated to developing this attribute and redeploy the resources saved to developing attributes located in the “concentrate here” quadrant. The next focus is to look at items for each attribute on which the HEIs needs to take immediate
### Table 4. Summary of means importance and actual performance.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Items</th>
<th>Importance</th>
<th>Performance</th>
<th>Gap (P-I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Explicit knowledge</td>
<td>6.408</td>
<td>5.633</td>
<td>-0.775</td>
</tr>
<tr>
<td></td>
<td>Tacit knowledge</td>
<td>6.376</td>
<td>5.637</td>
<td>-0.739</td>
</tr>
<tr>
<td>Skills</td>
<td>Hard skills</td>
<td>6.400</td>
<td>5.629</td>
<td>-0.771</td>
</tr>
<tr>
<td></td>
<td>Soft skills</td>
<td>6.431</td>
<td>5.623</td>
<td>-0.808</td>
</tr>
<tr>
<td>Abilities</td>
<td>Intellectual abilities</td>
<td>6.403</td>
<td>5.615</td>
<td>-0.788</td>
</tr>
<tr>
<td></td>
<td>Physical abilities</td>
<td>6.333</td>
<td>5.662</td>
<td>-0.671</td>
</tr>
<tr>
<td>Personality</td>
<td>Conscientiousness</td>
<td>6.427</td>
<td>5.638</td>
<td>-0.789</td>
</tr>
<tr>
<td></td>
<td>Agreeableness</td>
<td>6.343</td>
<td>5.607</td>
<td>-0.736</td>
</tr>
<tr>
<td></td>
<td>Emotional stability</td>
<td>6.449</td>
<td>5.643</td>
<td>-0.806</td>
</tr>
<tr>
<td></td>
<td>Openness</td>
<td>6.423</td>
<td>5.656</td>
<td>-0.767</td>
</tr>
<tr>
<td></td>
<td>Extroversion</td>
<td>6.464</td>
<td>5.645</td>
<td>-0.819</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td>6.405</td>
<td>5.635</td>
<td></td>
</tr>
</tbody>
</table>

(P-I) value is significant at $P<0.05$.

Figure 2. Importance-performance map. Note: 1. explicit knowledge, 2. tacit knowledge, 3. hard skills, 4. soft skills, 5. intellectual abilities, 6. physical abilities, 7. conscientiousness, 8. agreeableness, 9. emotional stability, 10. openness, 11. extroversion.

These fall into the “concentrate here quadrant” and require a reduction in resource allocation from dimensions that are underperforming in the “possible overkill” quadrant.
**“Concentrate here” quadrant**

There are two factors that fall into this quadrant; soft skills and conscientious personality.

**Soft skills factor**

Soft skills are difficult to describe and intangible. An example might be a bedside manner, a pleasant voice or a cooperative spirit. Leadership, creativity and the ability to teach and learn are all considered soft skills and they are really the essence of what an employer is looking for in a job applicant (Robbins and Judge, 2009). Mean importance-performance for this factor is 6.43 and 5.62 respectively. There are five items under this factor; 1) Able to solve situational problems, 2) Presents strong leadership skills, 3) Able to establish good relationships with co-workers, 4) Able to establish good relationships with top managers, and 5) Able to establish good relationships with senior staff members. Figure 3 indicates that one item falls into the “concentrate here”, “keep up the good work” and “possible overkill” quadrant. Another two items fall into the “low priority” quadrant. Supervisors or managers of graduates from these HEIs are satisfied with their co-workers in terms of their ability to establish good relationships with co-workers. However, supervisors or managers commented that these graduates need to improve their skills related to establishing a good relationship with their top managers. At the same time, they have reservations about the graduates’ abilities in relation to maintaining a good relationship with senior staff members, and an ability to solve situational problems. These attributes may not be important at the moment, but such requisites can emerge and HEIs must allocate resources to develop these qualities in their graduates in the future. Presenting a strong leadership skill is an item that requires the HEIs to immediately remove resources allocated in developing this attribute and redistribute the resources saved to develop attributes located in the “concentrate here” quadrant.

**Conscientious personality factor**

Conscientious personality is a tendency to show self-discipline, act dutifully, and to aim for achievement. This personality is planned rather than spontaneous behaviour. Mean importance-performance for this factor is 6.43 and 5.64, respectively. There are five items in this factor; 1) Willing to accept responsibilities, 2) Works in an organize manner, 3) Passionate about job responsibility, 4) Ability to meet task datelines, and 5) Participates actively in the work environment. Figure 4 indicates that one item falls into the “concentrate here”, “keep up the good work” and “possible overkill” quadrant.

![IPA Map for soft skills factor](image_url)
good work” and “possible overkill” quadrant. Another two items fall into the “low priority” quadrant. Supervisors or managers of these graduates suggested that graduates from these HEIs need to organize their work more systematically. Thus, HEIs need to take immediate action on these attributes when designing their curriculum. At the same time, supervisors or managers commented that these graduates were willing to accept the responsibilities given to them, which in fact, is one of these graduates’ strengths. In the meantime, HEIs need to remove resources allocated to develop the “Participate actively in work environment” attribute and redeploy the resources saved to develop attributes in the “concentrate here” quadrant. Finally, supervisors or managers have reservations about the graduates’ abilities in relation to their passion for their job responsibilities and their ability to meet task datelines. These attributes may not be important at the moment, but such requisites can appear and HEIs must allocate resources to develop these qualities in their graduates in the future.

“Possible overkill” quadrant

A physical ability is the only factor that falls into this quadrant.

Physical abilities factor

Physical abilities are described as abilities that are required to do tasks that required stamina, dexterity, strength and similar characteristics. Mean importance-performance for this factor is 6.33 and 5.66 respectively. There are four items under this factor; 1) Confronting problems effectively, 2) Ability to cope with work pressure, 3) Having strong mental endurance, and 4) Displaying a proactive disposition. Figure 5 presents these four items, where one item falls into the “concentrate here” quadrant and “possible overkill” quadrant respectively.

Managers or supervisors in the samples commented that graduates need to have the ability to cope with work pressure. HEIs need to take immediate action on this attribute when designing or improving their curriculum. At the same time HEIs need to remove their resources allocated to the graduates’ attribute of “displaying a proactive disposition” and redeploy this resource to the “concentrate here” quadrant attribute.

There are two items that fall neither into the “concentrate here” quadrant nor into the “low priority” quadrant, namely the ability to confront problems effectively and having strong mental endurance. HEIs need to check these two attributes from time to time according to market demand. HEIs also need to consider
these attributes when designing or updating their curriculum.

CONCLUSION AND FUTURE RESEARCH

This study has provided evidence of the usefulness of the IPA in designing curriculum development strategies for HEIs in Malaysia. The outcome of the analysis provides impetus for enhancing the quality of the higher education curriculum and making it relevant to the needs of the market and industries. The study highlights the practicality of the IPA as a means of assessing and directing continuous curriculum development efforts within the higher education sector. The use of the IPA in evaluating managers’ perceptions of graduates’ can identify how graduates are performing, identify specific problem areas and help target corresponding improvement efforts.

The study reveals the factors relevant to the managers’ perceptions of the graduates and their satisfaction level with the performance of the HEI’s graduates. The results of this study indicate that managers attach different weightings to different aspects of the graduates’ performance and, therefore, curriculum development efforts should be directed towards attributes that are expected of the graduates. This will allow for corrective actions which can then be taken to improve perceived problem areas.

The findings also supported the suggestion reported by Abdullah (2009) on the Integrated Approach proposed by Dr. Ranjit Singh Malhi, a CEO and Principal Consultant of TQM Consultants Sdn. Bhd. and Self-Esteem Seminars Sdn. Bhd. He proposed an Integrated Approach to HEIs which includes a compulsory stand-alone Personal Development Module for developing soft skills. He recommends a holistic approach to enhance graduate employability by embedding soft skills into the curriculum, getting students involved in extra-curricular activities, work placements and vocational guidance on how to get a job.

The findings of this study suggest that the HEIs in Malaysia should target improvements or inclusions of soft skills and a specific personality development component pertaining to conscientiousness in their curriculum. These HEIs should reduce their resources for enhancing physical abilities in the curriculum and maintain a low level of resource deployment in developing knowledge, hard skills, intellectual abilities and a sense of agreement in the manner in which their curriculum is delivered.

Clearly, from the above discussion, this study contributes new findings to the field of graduate employability and HEIs’ curriculum development. Besides focusing on the knowledge, skills and abilities; this study introduces the big five personalities (KSAP) which are also vital for graduate employability. The graduates need to be equipped with such personalities in order to be competent, industrious, of high quality and able to fulfil

Figure 5. IPA map for physical abilities factor. Note: 1. Confronting problems effectively, 2. Able to cope with work pressure, 3. Strong mental endurance, 4. Display a proactive disposition.
the industry’s requirements. The findings also supported the resource-based view and the alliance theory that were used as underlying theories in this study. Evidently, the HEIs should undertake extensive employer research in order to identify those factors to be in evidence when evaluating graduate performance. Consequently, this information can assist in decision making on a range of fronts, including facilities development, positioning their attributes, curriculum development and the delivery of the core curriculum in Malaysia, in an effort to produce a competitive workforce for the international marketplace.

It should be noted that this is a case study of graduates from HEIs in Malaysia. Future research could seek to establish whether a consistent pattern is observable across graduates from all other HEIs in different categories of industry and different levels of managers’ expectations among other countries within the South East Asian region. This would facilitate a greater mobility of graduates within the region. It also should be noted that the quantitative analysis used does not explain why the observed ratings occurred. A supplementary exploratory study is required to address this concern. However, it must be remembered that the managers’ expectations and performance ratings for specific attributes change over time due to changes in the macro environment.

ACKNOWLEDGEMENTS

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Full Length Research Paper

The investigation and analysis impact of brand image in Iran

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Brand is a powerful tool to attract more consumers to buy particular products. Some may even regarded it as equity as it can add values to the products. The objective of this paper is to conduct a study of brand image and provide recommendations for brand image enhancement after theoretical analysis of brand image on sales. This research has been done as a comparison between the products of Samsung and LG in Iran with respect to their brand image such that the following questions arise: Does the brand image has any impact on the fast moving consumer good’s consumption of different companies? Does brand image affects consumer behavior? For this research, questionnaire was used. Brand image can be reinforced by brand communications, such as packaging, advertising, promotion, customer service, word-of-mouth and other aspects of the brand experience. This will also be seen having different kind of questions in questionnaire to cover as many aspects of brand image. The results show that, there were more users of LG Products as compared to Samsung with advertising, customer satisfaction and innovation positively correlated with brand image.

Key words: LG, Samsung, brand, image, customer satisfaction.

INTRODUCTION

It is necessary to control and manage brand image continuously, which is one of the most important components of brand. Understanding a brand image is of key importance to long-term management of a brand. It is also important how the consumers formed the brand and what kind of relationship was formed with the brand? What the brand means to them and how they have accepted it. How it affects sales of different organizations. The image basically expresses the way a consumer thinks about the brand and the feelings the brand stimulates when the consumer thinks about it. On the basis of these characteristics, which the consumer associates with the brand, the company can build a competitive advantage for its brand. Kotler (2000) contends that brand is a name, term, symbol, design or all that has been mentioned, and is used to distinguish one’s products and services from competitors. The brand itself, does not ensure the competitive advantage of the company in the market. Good results are achieved just by those companies which are capable of managing their brands.

The conception of brand image combines the identification of brand image with intangible assets of the company that needs to be managed in order to use it efficiently. This research would distinguish the factors determining brand image, as a product comparison of Samsung and LG in Iran. In this research brand image is dependent variable while advertising, customer satisfaction and innovation are independent variables. Brand image can be positioned in consumer's mind through advertising that can be aggressive for the product which is in introductory phase. When the customer gets satisfied from the product, there would be positive words of mouth and that would improve brand's image. Innovation improves the brand, attracts the
customer and also helps in customer retention which improves brand image too. Innovation in a certain product or company helps building stronger customer base that helps in getting more market shares leading to better brand image. For a product, a comparison was made on refrigerator and television brands of both companies to see the effects of independent variables on dependant variable. This kind of research has previously not been conducted in Iran, and as such the research is broader in terms of selection of products and can be beneficial for the Samsung and LG in Iran. The two refrigerator brands for comparison are “side by side” which is of Samsung and “side by side” which is of LG and the two television brands are “plasma” which is of LG and “plasma” which is the product of Samsung.

The American Customer Service Index (ACSI) is the first U.S. economic indicator to measure customer satisfaction. Fornell (1992) acknowledges this growth and importance by rating customer satisfaction with the goods and services of 200 companies. Brand perceptions are important because they are said to influence consideration and evaluation, and purchase (Nedungadi, 1990; Keller, 1993). Marketing activities are undertaken with the aim of changing or reinforcing the consumers' 'mindset' in some way. This includes; thoughts, feelings, experiences, images, perceptions, beliefs and attitudes towards a brand (Keller and Lehmann, 2003). Brand perceptions are attributes in consumers' memory that are linked to the brand name (Keller, 1993). Conveying a brand image to a target market is a fundamental marketing activity. Communicating a brand image to a target segment has long been regarded as an important marketing activity (Gardner and Levy, 1955). A well communicated image should help establish a brand's position, insulate the brand from competition (Oxenfeldt and Swarm, 1964) and therefore enhance the brand's market performance (Shocker and Srivivasan, 1979; Wind, 1973). Positioning/repositioning strategies, though incorporating the notion of image (and indirectly sales), do not typically indicate how the image can be managed over time. Instead, short-term, market-driven factors such as current consumer needs and competitors are used as a basis for managing the brand's image/position (Aaker and Shansby, 1982). Brand, with a symbolic concept is one designed to associate the individual with a desired group, role, or self-image. Brand management has become increasingly important, given the rapid change of the global market and elevation of competition (Nan-Hong, 2007). Brand image is established when consumers develop ideas, feelings and expectations towards certain brands as they learn, memorize and become accustomed to them (Keller, 1993).

The brand becomes a strategic platform that provides the framework for the satisfaction of customers' wants and needs” (Urde, 1999). In an increasingly competitive marketplace, greater emphasis is placed on brand image development as the basis for consumer discrimination (Meenaghan, 1995). It is important for firms to become more aware of customer perceptions and how customers associate brands within a total service network experience or process. Customers do not evaluate brands in isolation (Morgan et al., 2004).

LITERATURE REVIEW

Brand image

The concept of brands emerged from the domain of consumer products and was originally considered more or less synonymous with that category. Over the years, however, marketing scholars have reappraised the traditional brand concept and widened its meaning to include corporate as well as, product brands, and recognition of the fundamental differences between these levels (Balmer and Gray, 2003). Keller (1998) defined brand elements as those trademark able devices that help to identify and differentiate the brand. Brand image includes the totality of consumers' opinions about, experiences with, and attitudes toward a company or organization and their brand as compared with that of competitors. Brand image is pivotal in apparel purchase behavior because it impacts consumers' preferences and purchase intentions as well as their willingness to pay a premium price and recommend the brand to others. Market street research often measures a company's brand image by asking consumers, decision-makers, or key markets to rate the company and its competitors on factors they consider important, (Gayathari, 2007). Communicating a brand image to a target segment has long been regarded as an important marketing activity (Gardner and Levy, 1955; Grubb and Grathwhol, 1967; Moran, 1973; Reynolds and Gutman, 1984; White, 1959). The brand is viewed as a resource – or more specifically, a relational market based asset that creates value or equity (Srivastava et al., 1998). In their classic paper, Gardner and Levy (1955) wrote that, the long-term success of a brand depends on marketers' abilities to select a brand meaning prior to market entry, operationalize the meaning in the form of an image, and maintain the image over time. A brand concept should be viewed as a long-term investment developed and nurtured to achieve long run competitive advantage (Whan et al., 2006). Thakor and Katsanis (1997) believed that, brand image is one of the cues in product quality evaluation, particularly when it comes to experiential brand concept-image. Brand image is often used as an extrinsic cue to make a purchase decision (Richardson et al., 1994). Monroe (1988) says that a brand with a more positive image does have the effect of lowering consumers' product perception risks and increasing positive feedback from consumers. The marketing mix performs two interrelated tasks that affect the brand's image/position (and hence sales at the introductory stage).
The role brands play in the value-adding processes that leads to creation of the customers’ experiences (Berry, 2000; de Chernatony and Segal-Horn, 2003; Ballantyne and Aitken, 2007). Within this perspective, the brand plays a broader role where it interfaces not just with end customers but the company, its employees and a network of stakeholders. This perspective of branding is being referred to as the ‘service brand (Kasper et al., 2006). The first is communication of the brand image. Each element of the mix can affect the inferences consumers develop about the brand (Frey, 1961; Lindquist, 1974, 1975; Olson, 1977; Sacharow, 1982). When a particular brand image is introduced, elaborated, and fortified, the costs associated with introducing other products become lower and the time required to move from introduction to elaboration for the new products is reduced (Park et al., 2006).

**Customer satisfaction**

Customer satisfaction is a key component of competitive strategies and keeping customers happy is critical to long-term business success (Stank et al., 1997). Customer satisfaction is the customer’s after purchase judgment or evaluation of a specific product or service (Oliver, 1980). Customer satisfaction includes service quality, expectations, disconfirmation, performance, desires, affect and equity (Churchill and Suprenant, 1982; Glenn et al., 1998; Levesque and McDougall, 1996; Oliver, 1993; Patterson et al., 1997; Spreng et al., 1996; Szymanski and Henard, 2001). Customer satisfaction is generally defined in the marketing literature as the discrepancy between a customer’s expectations and perceptions (Oliver, 1997). Satisfaction is generally viewed as an encounter-specific construct (Bitner, 1990). Consumers usually go through confirmation of need, research prior to purchase, and product evaluation to make a purchase decision, and the last is a particularly important factor. Due to the fact that, there are always risks within any purchase decision, consumers rely on product information or cues to lower the risks. Consumers generally believe they can make a satisfying purchase by choosing well-known brands and also lower any purchase risks by doing so (Nan-Hong, 2007). Customer satisfaction is an important theoretical and practical issue for most marketers and consumer researchers (Westbrook, 1980; Dabholkar et al., 1996; Goode and Moutinho, 1996; Patterson, 1993; Spreng et al., 1996; Fournier and Mick, 1999; Meuter et al., 2000). When a service failure occurs, the organization’s response has the potential to either restore customer satisfaction or reinforce loyalty (Smith et al., 1999). Satisfaction with a purchased product and/or a service is a fundamental goal for consumers. Rogelberg and Creamer (1994) have suggested that customer service satisfaction significantly impacts subsequent purchase behavior. Consumers seek to allocate monetary resources among available products and services to maximize their satisfaction. For marketers, consumer satisfaction is also a desired outcome of marketing activities. Satisfaction reinforces consumers’ brand and store loyalty and/or resolution to buy the product frequently (Chen-Yu and Hong, 2002). Product involvement has also been found to have a direct effect on the level of satisfaction (Richins and Bloch, 1991), as well as a mediator between mood and shopping intentions (Swinyard, 1993). Rogelberg and Creamer (1994) have suggested that customer service satisfaction significantly impacts subsequent purchase behavior.

**Advertising**

It is the paid, non-personal communication of information about products or ideas by an identified sponsor through the mass media in an effort to persuade or influence behavior (Courtland, 1987). Advertising is intended to achieve higher order communication effects in audiences opposed to the advocated position (Nelson et al., 1985). Factors such as high advertising costs and the increasing competition for shelf space, has become more difficult to succeed with new products (Aaker, 1991, 1996). One of the ultimate aims of advertising is to persuade consumers to buy certain brands over others. A classical conditioning explanation provided the theoretical rationale for the transference of effect from the ad to the brand (Shimp, 1981). To achieve this goal, many advertisers utilize advertisements with a clear conclusion (Beardi, 2001; Halliday, 2001). Advertising would continue to be influential, if advertising were also provided for the non focal brands (Sirdeshmukh, 1992). Kamins et al. (1991) found that subjects viewing a happy commercial brand evaluated it more positively on various measures of advertising effectiveness in the context of program content designed and observed to induce a happy mood. Positive advertising effects are found if the message style of the ads is in contrast with the nature of the context (Meyers et al., 1997). When companies form partnerships with a celebrity through an endorser association, they must be prepared to deal with the risks. In some cases, the decision is clear from the nature of the negative event (Louie and Carl, 2002). Involvement represents the amount of arousal or interest evoked by a particular advertisement (Mitchell, 1979). The amount of arousal or interest determines the degree of attention devoted to an advertisement and also influences the processing strategy. One processing strategy used by receivers is to actively process advertising information so as to form an overall evaluation of the advertised brand (Mitchell et al., 1980). There has been considerable debate regarding the most appropriate measures for predicting advertising effectiveness (Blair and Rosenberg, 1994; Haley, 1994; Haley and Baldinger, 1991; Harvey, 1997; Rossiter and
Eagleson, 1994; Walker and Dubitsky, 1994). As an indication of the increasing popularity of Internet advertising, overall Web advertising revenue in the United States has grown consecutively for the past eighteen quarters with revenues for the first half of 2000 reaching $4.1 billion U.S. (Cyber, 2000). The function of generating attention in advertising is to increase exposure and then allow the message to influence brand awareness and ultimately consumer decision-making (Rossiter and Percy, 1997). Attracting attention alone is usually insufficient to stimulate consumer action, as much that is noted, is subsequently discarded by consumers before further processing can occur. Advertising can be viewed as a variable field created by the merged interests of communication and marketing. Variable fields grow or fade based on changing interests and concerns in society. A variable field begins when a group of scholars develop a common interest in a phenomenon and begin to systematically investigate it (Paisley, 1972).

A firm can influence the perception of an extension by providing information cues through advertising and other marketing mix activities (Aaker and Keller, 1990). Advertising conditions, that is, affective reactions to an ad are likely to influence evaluations of the sponsoring brand and was significantly related to both attitude toward the brand and attitude toward purchasing the brand in advertising (Darrel, 1987).

Innovation

Innovativeness is a personality trait related to an individual’s receptivity to new ideas and willingness to try new practices and brands. The importance of innovativeness has been examined extensively in the literature on diffusion of innovation (Rogers, 1983) and consumer behavior (Engel et al., 1990). The results indicate that these groups of firms significantly differs with respect to both subjective and objective measures of new product performance, and with product innovation strategies and activities pertaining to timing of market entry, product quality, marketing synergy, proficiency of market launch, and management support for innovation (Atuahene-Gima and Ko, 2001). The market opportunities of firms and the development opportunities of regions depend increasingly on their capacity to continuously generate innovative products and processes (Rolf and Arndt, 2001). A common observation is that individuals high in innovativeness are more venturesome and more willing to try new brands (Stenkamp and Baumgartner, 1992). In the services sample (telecom brand), there is a positive relationship between the extent to which consumers are innovative and the extent to which services brand extensions are favorably evaluated (Hem and de Chernatony, 2001). The private value of innovation can be quite different from the private value of the intellectual property associated with that of innovation (Sherry and Teece, 2003). Innovators differ in their ability to commercialize their innovations, and the value that the innovator can obtain from commercialization depends not only on the appropriability regime but also on the commercialization strategy that the innovator chooses (Teece, 1986). This aligns with the arguments of Keller and Aaker (1997) that an innovative corporate image leads to positive brand extension evaluations. The historic district offers competitive advantages to its constituent firms by providing a unique set of skills and resources that can constitute a distinctive local capability within a "global marketplace" (Maskell and Malmberg, 1999) and by enabling the rapid circulation of information on market trends and new design innovations that are demanded by a cultural economy (Jameson, 1990; Scott, 2001). Relative product advantage is the most important product innovation characteristic. A major product advantage typically generates major market share rewards, whereas a moderate advantage generates moderate rewards (Robinson, 1990). Highly innovation-supportive cultures are credited with fostering teamwork and promoting risk-taking and creative actions that seem directly linked to effective new product development (Jassawalla and Sashittal, 2002). The need for organizational innovation and renewal has been recognized, not only to withstand the gales of creative destruction, but also to create them (Schumpeter's, 1942). Product innovation have been recognized as a primary means of corporate renewal (Dougherty, 1992), and as an 'engine of renewal' (Bowen et al., 1994).

DATA COLLECTION METHODS

The data was collected from the consumers of Tehran, Gilan, Isfahan, Tabriz, Mashhad and Kish. It took a couple of months to gather up the entire questionnaire back although, they were 250 in numbers. The respondents should have gotten enough time to fill up the questionnaire such that they only provide the absolute information which can be very fruitful for the research. The questionnaire was made by having questions relating to independent variables which were advertising, customer satisfaction and innovation and their effect has been seen on the dependant variable that is brand image. Likert scale was being used in the questionnaire.

There were generally 250 respondents, out of which 57% were females and 43% were male respondents, data was almost collected from all the age groups but the most respondents were of the age between 20 to 30 years, were 67%, the respondents from the age 30 to 40 years were 21% and from 40 to 60 years were 12%. The respondents were mostly educated; there were 20% who were post graduates respondents, 44% were bachelors, 20% respondents has their education till high schools. The respondents which were having jobs were 56%, out of which 98 were having job tenures in between 1 to 10 years as seen in Table 1.

Theoretical framework

In this research, dependant variable is brand image and independent variables are advertising, customer satisfaction and innovation (Figure 1). Brand image can be directly affected by
Table 1. Frequency distribution.

<table>
<thead>
<tr>
<th>Variable</th>
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<td>43</td>
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<tr>
<td></td>
<td>Female</td>
<td>142</td>
<td>57</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>150</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Age</td>
<td>20-30</td>
<td>168</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>30-40</td>
<td>52</td>
<td>21</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>30</td>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>250</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Qualification</td>
<td>Matriculation</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>High school</td>
<td>50</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Bachelor</td>
<td>110</td>
<td>44</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Master</td>
<td>90</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>P.H.D</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>250</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Tenure</td>
<td>1-10</td>
<td>245</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>10-20</td>
<td>5</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>250</td>
<td>100</td>
<td>-</td>
</tr>
</tbody>
</table>

Independent variables                  Dependent variable

Advertising
Customer Satisfaction
Innovation
Brand Image

Figure 1. Relationship between independent variables and dependent variable.

advertising as it positions the brand in the mind of the consumers, so brand image is dependent on advertising, since the initial product image has always been made by advertising. Brand image is also dependent on customer satisfaction; in other words, the more the customer would be satisfied with the product, the more positive would the words of his mouth be. It also maintains the brand image in its right position and also helps in improving brand image. Brand image is also dependent on the innovation product, as the consumer gets tired of seeing the old product, unless something new is added to the packaging of the brand’s shape. So innovation makes the customer more attracted towards the products, polishes the brand image and increase customers’ satisfaction as well.

Research hypotheses

H₁: The more the customer gets satisfied; the better would be the brand image.
H₂: Advertising and brand image has a positive relationship.
H₃: The more there would be product innovation; the better would be the brand image.
Table 2. The results of multiple regression analysis (MRA) between independent variables and dependent variable for LG Product.

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Std. error of the estimate</th>
<th>F-statistic</th>
<th>Durbin-Watson stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.473&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.223</td>
<td>0.212</td>
<td>2.96997</td>
<td>11.79</td>
<td>1.671</td>
</tr>
</tbody>
</table>

Coefficients<sup>b</sup>

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>Std. Error</td>
<td>β</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>6.733</td>
<td>1.724</td>
<td>3.905</td>
<td>0.000</td>
</tr>
<tr>
<td>Advertising</td>
<td>0.206</td>
<td>0.053</td>
<td>0.273</td>
<td>3.908</td>
</tr>
<tr>
<td>Innovation</td>
<td>0.109</td>
<td>0.052</td>
<td>0.144</td>
<td>2.091</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>0.183</td>
<td>0.054</td>
<td>0.220</td>
<td>3.415</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), advertising, customer satisfaction, innovation; b. Dependent variable: brand image.

Table 3. The results of multiple regression analysis (MRA) between independent variables and dependent variable for SAMSUNG products.

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Std. error of the estimate</th>
<th>F-statistic</th>
<th>Durbin-Watson stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.402&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.172</td>
<td>0.261</td>
<td>2.2387</td>
<td>11.23</td>
<td>1.821</td>
</tr>
</tbody>
</table>

Coefficients<sup>b</sup>

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>Std. Error</td>
<td>β</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>5.871</td>
<td>1.132</td>
<td>3.243</td>
<td>0.000</td>
</tr>
<tr>
<td>Advertising</td>
<td>0.187</td>
<td>0.045</td>
<td>0.221</td>
<td>3.247</td>
</tr>
<tr>
<td>Innovation</td>
<td>0.165</td>
<td>0.043</td>
<td>0.195</td>
<td>2.987</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>0.121</td>
<td>0.040</td>
<td>0.131</td>
<td>2.327</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), advertising, customer satisfaction, innovation; b. Dependent variable: brand image.

DATA ANALYSIS

The data has been analyzed with the help of correlation and regression analysis by SPSS software. It has been found that, there were more consumers of LG Products than of Samsung. Then the two products of Samsung and LG were compared to see the different factors determining brand image of which the correlation and regression analysis has been done between the dependent variable ‘Brand image’ and independent variables advertising, customer satisfaction and innovation.

Analysis for LG products

The result of multiple regression analysis (MRA) between independent variables and dependent variable for LG is showed in Table 2. Using enter method, a significant model was obtained in which R = 0.473, Durbin-watson stat=1.671 and R² = 0.223 meaning that, three independent variables explain 22% of dependent variables. According to sig column, it is observed that all of the variables are significant and the model is as shown thus:

\[ Y = 0.206 \times X_1 + 0.109 \times X_2 + 0.183 \times X_3 + 6.73 \]

According to beta column it can be said that, respectively, advertising has more impact or influence on brand image, variables and customer satisfaction and innovation are placed in subsequent grades.

Analysis for Samsung products

The result of multiple regression analysis (MRA) between independent variables and dependent variable for SAMSUNG products is showed in Table 3. Using enter method, a significant model was obtained in which R = 0.402, Durbin-watson stat=1.821 and R square = 0.402 meaning that three independent variables explain 22 percent of dependent variables. According to sig column, it is observed that all of the variables are significant and
the model is as thus:

\[ Y = 0.187\ X_1 + 0.165\ X_2 + 0.121\ X_3 + 5.87 \]

According to beta column it can be said that, respectively, advertising has most impact or influence at brand image and variables innovation and customer satisfaction are placed in subsequent grades.

Conclusion

This study attempts to incorporate brand image effect and competition into the framework and examination of the effects of brand image on advertising, customer satisfaction and innovation. Moreover, strong links exist between consumer attitudes to an advertisement and their attitude towards the brand featured in the advertisement; customer satisfaction and innovation; consumer attitude towards an advertisement and perceptions of a brand directly influence their attitude towards that brand image; perception of an advertisement indirectly influences attitude towards a brand through the consumer's attitude towards that advertisement; and attitude towards an advertisement can influence consumer attitude to a brand through the consumer's knowledge or perception of that brand image.

After having the analysis, it has been found that the brand image has a positive correlation with all of the three independent variables. Brand Image is strongly and positively correlated with advertising, and some persons' distinguish the psychological aspect of a brand from the experiential aspect. The psychological aspect, sometimes referred to as the brand image, is a symbolic construct created within the minds of people and consists of all the information and expectations associated with a product or service that is through advertising. Brand image and advertising, both have a positive and strong relationship with each other. There are two main reasons for this positive relation. Firstly, through advertising, the public/customers would come to know about the product and brand, while advising and encouraging the public to buy or use such brand would attract people to it and would make the brand’s image to become high. If you want to cater more target, attract more customers, try advertising in the local paper and then let more people know about what’s going on, what is going to happen, what new things are coming, what new creating, innovation is happening. Secondly, advertising will increase the sales of any brand also increase the brand image. The aim of this article is to aware the public/customer regarding brand image and advertising and also important of these two factor on each other, how they influence each other, how advertising motivate the people to increase the brand image.

People engaged in branding, seek to develop or align the expectations behind the brand experience, creating the impression that a brand associated with a product or service has certain qualities or characteristics that make it special or unique. A brand is therefore, one of the most valuable elements in an advertising theme, as it demonstrates what the brand owner is able to offer in the marketplace. A cleverly crafted advertising campaign can be highly successful in convincing consumers to pay remarkably high prices for products which are inherently extremely cheap to make. It has been noticed that, whenever a company goes to launch a product, it starts to make the brand image of a product, position the product in the consumer’s mind and the product is always being aggressively advertised. So, it shows that advertising has direct and strong impact on brand image. It has also been found that brand image is positively correlated with customer satisfaction. In a competitive marketplace where businesses compete for customers, customer satisfaction is seen as a key differentiator and increasingly has become a key element of business strategy. It is correlated in such a way that when customer gets satisfied, there would be positive words of mouth from the customers and then there would be more customers attracted towards the product. It has been seen that the customers of side by side refrigerator and plasma which are the brands of LG are more satisfied rather than Samsung and plasma which are the brands of Samsung.

However, it has also been seen that due to less satisfaction, LG products have more customers than Samsung products. The state of satisfaction depends on a number of both psychological and physical variables which correlate with satisfaction behaviors such as return and recommendation rate. The level of satisfaction can also vary, depending on other options the customer may have and other products against which the customer can compare the organization's products (Bart Allen, 1990). However, existing information processing suggests that consumer satisfaction process attribute information independently for brand image and compare the values. Numerous studies have stated that an customer satisfaction can influence the brand image. It has also been seen that brand image is positively and strongly correlated with innovation. The term innovation means a new way of doing something. It may refer to incremental, radical, and revolutionary changes in thinking, products, processes, or organizations. A distinction is typically made between invention, an idea made manifest, and innovation, ideas applied successfully (Mckeeown, 2008). Innovation has strong impact in building a brand image, the LG products are more innovated than Samsung in Iran, the advertisements has some innovation that were made between invention, an idea made manifest, and innovation, ideas applied successfully (Mckeeown, 2008).
teams is a starting point for innovation; the first is necessary but not sufficient condition for the second". It has also been seen through the results that innovation has positive and strong correlation with brand image in all the products. The study is focused on brand image impact on innovativeness. The relationship between innovativeness with brand image is very strong and the future innovation enhances competitiveness, information and brand image. Behind every great brand, lies a valuable social benefit delivered through innovation, value, choice effectiveness, taste, functionality and convenience to prosper. Businesses have to offer consumers these benefits and when they do, people’s lives improve. Without brands, there would be no point for the business to compete, invest and innovate.

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Satisfying the indigenous food needs of sub-Saharan African immigrants in South Africa: A food consumption behaviour model for South Africa’s leading supermarket chains

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This study aims to establish a food consumption behaviour model of sub-Saharan African immigrants in South Africa in order to enable South Africa’s leading supermarket chains to cater for their indigenous food needs. One of the effects of the fall of the apartheid regime is a growing increase of sub-Saharan African immigrants in South Africa. This has also given rise to an increase in the demand for indigenous foods. South Africa’s leading supermarket chains have acknowledged the growing potential of the emerging immigrant market and are interested in catering for their culinary needs. However, these chains lack the understanding and knowledge of the market; hence, the purpose of this study is to devise measures aimed at catering for their needs. The methodological framework comprised an elaborate review of contemporary studies in migration and immigrant consumer behaviour; a questionnaire survey and interviews with sub-Saharan African immigrants; as well as interviews with ethnic entrepreneurs and executives of leading supermarket chains in South Africa. This study will make a contribution in enhancing knowledge on the food consumption behaviour of sub-Saharan African immigrants in South Africa. It could also serve as a reference document for South Africa’s leading supermarkets and other organisations that may be interested in the sub-Saharan African immigrant market. Furthermore, it may serve as a valuable resource for academians who may wish to develop and pursue new areas of research in immigrant consumer behaviour.

Key words: Apartheid, sub-Saharan African immigrants, consumer behaviour, food, South African supermarket chains, culture, ethnic entrepreneurs.

INTRODUCTION

Since the fall of the apartheid regime, South Africa has experienced a dramatic increase in the number of immigrants predominantly from sub-Saharan African countries. This has also resulted in an increase in the demand for indigenous foods. However, unlike their counterparts in Canada, Australia and America (hosting large numbers of sub-Saharan African immigrants), South Africa’s supermarket chains are yet to cater for the indigenous food needs of sub-Saharan African immigrants in South Africa. Nevertheless South Africa’s leading supermarkets cater for the food needs of immigrants from Europe, America, Asia, Canada and India.

It is worthy to highlight that leading supermarket chains in South Africa acknowledge and appreciate the potential of the sub-Saharan African market in the retail industry and the economy at large. They have also expressed interests to cater for their indigenous food needs but lack a deeper understanding and knowledge of the food consumption behaviour of the market.
In this regard, this study attempts to establish a food consumption behaviour model of the sub-Saharan African immigrant market in order to enable South Africa’s major supermarket chains to cater for their food needs.

LITERATURE REVIEW

The literature review looks at the structure and people of sub-Saharan Africa, migration to and adaption in South Africa and the consumer behaviour of immigrants.

The structure and people of sub-Saharan Africa

Sub-Saharan Africa is a term used to describe the area of the African continent which lies south of the Sahara desert or those countries which are fully or partially located south of the Sahara. It comprises of 42 countries; split as follows:

b) East Africa: Sudan, Kenya, Tanzania, Uganda, Djibouti, Eritrea, Ethiopia and Somalia.
c) Southern Africa: Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.
e) African Island Nations: Cape Verde (West Africa), Comoros (Southern Africa), Madagascar (Southern Africa), Mauritius (Southern Africa) Sao Tome and Principe (West Africa) and Seychelles (East Africa) (Dolan and Hobbs, 2009; Holloway, 2005).

There are many nations and hundreds of different ethnic groups in sub-Saharan Africa. Each region has many different cultures and people. The most prominent sub-Saharan African people are the Bantu. They constitute almost two thirds of the population in sub-Saharan Africa. The Bantu people belong to the same language group. According to Burns and Collins (2007), the most abiding part of sub-Saharan African heritage is its cultural value system (Bailey, 2008) maintains that as a distinct cultural region, the cultural unity rests on similar characteristics shared to varying degrees by many popular cultures or small traditions.

The migration of sub-Saharan African immigrants to South Africa

Migration is one of the greatest constants of human history. Long before political borders emerged, people were already traveling from one part of the world to another (Manning, 2005). According to historians, sub-Saharan African immigrants started migrating since about 1000 B.C. in what is known in history as the Bantu migration. For centuries they moved south and east, ultimately spreading along the coast. During their migrations, the Bantu absorbed or displaced other Negroid peoples of eastern and southern Africa, driving pygmies, Bushmen, and Khoisan speaking pastoralists into the southern jungle, the Kalahari Desert, or the extreme southwestern savanna. Thus Bantu migrants provided most of sub-Saharan Africa with a common cultural identity.

The dynamics of contemporary migration in sub-Saharan Africa has broadened both in scope and causes, but predominantly takes place within the continent. This is contrary to the prevailing belief caused by one-sided media coverage that a large share of African migrants relocates to Europe, or the developed states in the North. Research has shown that the majority of sub-Saharan African immigrants are within Africa. Only 1.5% of all sub-Saharan Africans, living outside their country, live within the European Union. More than two-thirds of all migrants, from sub-Saharan Africa migrate to other countries within sub-Saharan Africa (BICC, 2009).

South Africa is one of the primary destinations of migration within sub-Saharan Africa. Historians have equally argued that the movement of migrants from other sub-Saharan African countries to South Africa is not a recent phenomenon. During the apartheid era, South Africa was host to many Africans mostly from Southern African countries. The majority of these migrants were labourers who worked in the mines and plantations. However, the population of migrant labourers was relatively small compared to that of sub-Saharan African immigrants in the country today; this was largely because the residential policies of the apartheid Government prohibited black migrants from living permanently in South Africa (Bailey, 2008).

The demise of the apartheid government and the establishment of a democratic dispensation in 1994 cleared the way for millions of Africans from other sub-Saharan African countries to settle in South Africa. Though the exact figures are unknown, a study by the South African Institute of Race Relations found that approximately five to ten million sub-Saharan African immigrants currently reside in South Africa. South Africa is by far the continent’s wealthiest state, both in gross domestic product (GDP) per capita and in total GDP. Thus, the majority of sub-Saharan Africans migrate to South Africa to improve their living conditions and for educational purposes. Undoubtedly, sub-Saharan Africa is the poorest region in the world suffering from the effects of economic mismanagement, corruption in local government, inter-ethnic conflict, diseases such as malaria and HIV/AIDS, low life expectancy, malnourishment and high infant mortality, underdeveloped agricultural systems, drought and lack of infrastructure, electricity, water and health
facilities which are fundamental impediments to economic development (Materu, 2007; Taylor and Massy, 2004). Nevertheless, in pursuit of their objectives for moving to South Africa, sub-Saharan African immigrants confront numerous challenges. These include: the rigorous terms and conditions of residency in South Africa, lack of accommodation, employment and awareness and knowledge of how to access and make use of community resources, eccentric behaviours of the South African public which include prejudices, stereotypes, aggressively privileged opportunities along racial, class and citizenship lines and above all, the absence of indigenous foods in South Africa's major supermarkets. For the majority of sub-Saharan African immigrants in South Africa, the absence of foodstuffs from their countries of origin in South Africa’s leading supermarkets is one of the major challenges faced in South Africa (Njomo, 2006; Mwakikagile, 2008).

The majority of sub-Saharan African immigrants (especially new arrivals) are unfamiliar with most food products in South Africa and the methods of food distribution. It is worthy to highlight that the supermarket industry in most sub-Saharan African countries is underdeveloped; hence, groceries are predominantly done in open market structures managed by the local municipality. Therefore, upon arriving in South Africa, not only are they faced with the challenge of adapting to the local food products, most sub-Saharan African immigrants also face the challenge of learning to shop in supermarkets (Njomo, 2008).

Immigrant adaptation and food consumption behaviour

Adaption is one of the most important elements in migration studies. Scholars have predominantly (Margar, 2009; Hostfman et al., 2006; Berry et al., 2006) looked at acculturation as the most important mode of immigrant adaptation in host societies. The concept of acculturation has been defined differently in different disciplines and contexts. Within the area of consumer research, acculturation has been defined as a process whereby immigrants acquire the traits of the host culture and at the same time maintain the traits of their culture of origin (Laroche et al., 1997). It has been observed by researchers (Chattalas and Harper, 2007; Batra et al., 2006) that as the individual lives and participates in the new culture, he/she begins to internalize the normative expectations prevalent in that culture, which includes complying voluntarily with the food consumption behaviour patterns which reflect the values and beliefs of the new culture. Studies (Batra et al., 2006) have largely examined the food consumption behaviour of immigrants in the host country in the context of the relationship between food and culture. A study by Couniham and Esterik (2008) argues that immigrant food consumption includes many symbolic aspects and not just functional activities because immigrants have been found to seek food products less for their use value than for what is termed cultural value. Anderson (2005) argues that food is not just feed; it embodies history, memory, tradition, invention, place, diaspora, cultural values and reflects both continuity and change. In a similar analysis, Janer (2008) remarks that the meanings of food products express cultural categories and principles, cultivate ideals, create and sustain lifestyle, construct notions of the self and create (and survive) social change.

Nnakwe (2009) remarks that, as immigrants live longer in the host country they start to think creatively by modifying their indigenous foodways to incorporate relevant local foodstuffs and consumption patterns of the host society. Kirova and Adams (2006) maintain that in most cases unavailability and/or inaccessibility of indigenous foods compels immigrants to switch their food requirements to comply with local availability. A study by Kuma and Lal (2007) depicts that the desire to adapt to the foodways of the host country indirectly strengthens the need for indigenous foods and the connection between immigrant societies and their homelands. Kuma and Lal’s (2007) assertion finds strong evidence in Jennissen’s (2004) study of Italian labor immigrants in Belgium where it was revealed that despite Belgium’s efforts to assimilate Italians to Belgian foodways, Belgian Italians still cook as they do back home. According to Connel (2009), the kinds of foodstuffs consumed by immigrants and the method of preparation recall families and friends left behind and by continuing to consume homeland foods immigrants preserve this transnational relationship and enact their companionship with those back home.

An illustrated example is also found in Roger-Winaro’s (2006) study of Indonesians in Australia. Winarto (2006) found that most gatherings of Indonesians in Australia whether formal or informal include food (exclusively Indonesian menus) as a central element. Markovitsch and Rottger–Rossler (2008) argue that such social interactions reflect cultural conformity; consuming the familiar while constructing an interdependent collective/public self-image of the group within the wider community. This article seeks to establish a food consumption behaviour model of sub-Saharan African immigrants in South Africa in other for South Africa’s major retail chains to establish measures to cater for their food needs. Therefore, in realizing the purpose of this study, the author has used the context of consumer behaviour as the framework.

THE CONCEPTUAL FRAMEWORK OF CONSUMER BEHAVIOUR

Research (Felipe and Betty, 2005) argues that an organization’s marketing campaign will be futile without a knowledge and understanding of the consumption behaviour of its target consumers. Macinnis and Hoyer
(2008) have defined consumer behaviour as “the totality of consumers’ decisions with respect to the acquisition, consumption, and disposition of goods, services, time, and ideas by human decision making units over time”. According to Macinnis and Hoyer (2008) consumer behaviour involves more than just the way that a person buys tangible products such as a book or a car. It also includes consumers’ use of services, activities, experiences and ideas such as going to the doctor.

Consumer behaviour consists of two parts. These include the factors that influence the consumer’s choice of products and the consumer’s decision making process.

Factors that affect consumer behaviour

Two main sets of factors influence consumer behaviour. They are individual and group or social factors.

**Individual determinants of consumer behaviour**

These include: age, income, gender lifestyle, personality, attitude, motivation, beliefs, mood and learning.

**Age**

It goes without saying that consumer’s preferences and tastes undergo considerable changes with age. For instance, the food requirements of an older person will differ significantly from those of younger ones (Majumdar, 2010).

**Income**

A consumer’s lifestyle can change if his income increases or decreases. Income determines why, what, and when people buy goods and services (Quester et al., 2004).

**Gender**

The physiological differences between men and women result in different needs such as health, beauty products, cars and clothes (Quester et al., 2004).

**Personality**

Personality influences the feelings, thoughts, intentions, and behaviour of individuals (Mowen, 2000). In other words, how consumers view themselves relates to their consumption of goods and services (Majumdar, 2010).

**Mood**

Consumers in good mood are more likely to like a brand, product or service. On the other hand, consumers in a bad mood are likely to feel worse and downgrade their judgments of the product being sold especially when they interact with salespeople who seem to be unhappy (Macinnis and Hoyer, 2008).

**Memory**

Memory refers to the process of retention of information about past events and ideas. It also involves the capacity to learn, to be influenced by prior experience(s) and to behave differently in the future as a consequence of an experience.

This greatly plays an important role in a consumer’s choice of products and services (Majumdar, 2010; Brenner, 1990; Mullen and Johnson, 1990).

**Self concept**

Individuals consume products and services based on the fact that the symbolic value of the products and services is congruent with his/her personal picture or image of his/herself. Thus, consumers use products to preserve and enhance their self image and avoid those that do not (Schiffman and Kanuk, 2010).

**Lifestyle**

It represents the external characteristics that pertain to how a consumer lives - the activities he engages in, his habits, his possessions, the interests he expresses, and what he sees as value in his life, reflected in the way he spends his time and money (Quester et al., 2004).

**Motivation**

A motive is a need sufficiently stimulated to move an individual to seek satisfaction. Consumer motivation represents the drive to satisfy both physiological and psychological needs through product purchase and consumption (Stanton et al., 2001; Pettitt and Brassington, 2003; Schiffman and Kanuk, 2010).

**Attitude**

An attitude is a learned predisposition to behave in a consistently favourable or unfavourable way with respect to an object. Attitudes can help gauge the acceptance of a product or service into the marketplace (Lake: 2009).

**Learning**

Consumer learning is a process by which individuals
acquire purchase and consumption knowledge as well as the experience that they apply to future related behaviour (Ranju and Mukesh, 2009; Schiffman et al., 2008). According to Law and Miles (2005) a consumer who learns about a product or service behaves rationally when making a decision than one without any knowledge about the product or service.

**Perception**

Perception is defined as the process by which an individual selects, organises, and interprets stimuli into a meaningful and coherent manner based on his/her needs, values and expectations (Schiffman and Kanuk, 2006; Stanton et al., 2001).

**Social factors that influence consumer behaviour**

Social factors that influence consumer behaviour include: reference groups, social class, family and culture.

**Reference groups**

In consumer behaviour, a reference group is defined as a group that serves as a point of reference for an individual in forming certain values. All reference groups have distinctive norms of behaviour. Thus, as a member of the group, you are expected to adhere to these norms; if not, sanctions may be applied to you (Cant et al., 2006).

**Social class**

A social class is defined as the division of members of a society into a hierarchy of distinct status or classes, so that members of each class have relatively the same status and members of all other classes have either more or less status. This greatly influences their choice of goods and services (Schiffman and Kanuk, 2010; Cant et al., 2006).

**The family**

In a more dynamic sense, the individuals who make up a family can be described as members of the most basic social group who live together and interact to satisfy their personal and mutual needs. In this regard, the family or household plays a key role in shaping the consumption behaviour of not only the individuals within the family but the family at large (Schiffman and Kanuk, 2010; Cant et al., 2006).

**Culture**

Culture is the adaptation of a people to the conditions of life. It distinguishes one group of people from another. Thus, the learned beliefs, values and customs of a peoples' culture serve to direct their consumption of goods and services (Blackwell et al., 2006; Mullins et al., 2005).

**The consumer decision making process**

The consumer decision making process is made up of five stages. These include: need or problem recognition, information search, evaluation of alternatives, purchase decision and post-purchase evaluation.

**Need or problem recognition**

This occurs when a consumer is faced with a problem. That is, when a consumer realizes a difference between what he or she perceives to be the ideal or desired state (the situation the consumer wants to be in). Need recognition is triggered when a consumer is exposed to either an internal or external stimulus. Internal stimuli are occurrences you experience such as hunger or thirst. External stimuli are influences from outside sources such as someone's recommendation of a new restaurant or retail shop, a brand name mentioned by a friend or an advertisement on television or radio (Blackwell et al., 2006).

**Information search**

In many buying situations, once the consumer has recognized the problem, he/she starts looking for information. Consumer information search entails the mental and physical activities undertaken by consumers to obtain information on identified problems. It is a learning process by which consumers become aware of alternative products or brands, specific stores, specific trading centers, prices of products, terms of sale and consumer services (Cant et al., 2006).

**Evaluating alternatives**

Consumers are exposed to a broad range of products and services to select from on a daily basis. The product options are not only varied but complex and sophisticated; hence, the need to evaluate the available options (Hoffman et al., 2005; Czinkota and Ronkainen, 2000). It is important to highlight that different consumers employ different evaluative criteria - the standards and the specifications used to compare different products and brands (Cant et al., 2006; Stephen and Beaton-Wells, 2003; McDaniel et al., 2008).

**Purchase decision**

The consumer makes a purchase decision when he/she
believes that the product’s benefits will satisfy his/her desired needs. The decision is based on the assumption that the alternatives generated have all been evaluated accurately and that the one chosen will best solve the consumer’s problem (Stanton et al., 2001; Danziger, 2004; Strydom et al., 2000).

**Post-purchase behaviour and decision**

All purchase behaviour as a continuous process must entail consequences for the buyer. In the post-purchase evaluation process, the consumer examines the level of satisfaction derived from the product. In other words, the consumer finds out whether the product solved his/her problem or satisfied the need (Reddy and Naik, 1999; Czinkota et al., 2000).

**METHODOLOGICAL PROCEDURES**

The methodological approach in all intents and purposes presents the specific tools used to acquire and measure data that enabled the author to realize the purpose of the research. The study was conducted in the Western Cape Province of South Africa with the notion of using the findings as a representation of the food consumption behaviour of the larger sub-Saharan African immigrant population in South Africa. The data collection method comprised of interviews and a questionnaire survey with sub-Saharan African immigrants. Interviews were also conducted with executives of South Africa’s leading supermarket chains and ethnic entrepreneurs.

A total of 409 immigrants from 26 sub-Saharan African countries took part in the study. The countries include: Democratic Republic of Congo, Rwanda, Burundi, Cameroon, Kenya, Tanzania, Uganda, Eritrea, Ethiopia, Somalia, Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, Zambia, Zimbabwe, Cote d’Ivoire, Gabon, Ghana, Niger, Nigeria, Senegal, Sierra Leone and Togo.

**Interviews with sub-Saharan African immigrants**

The author interviewed 173 of the 409 sub-Saharan African immigrant respondents. The interviews were aimed at establishing an understanding of the immigrants’ consumption behaviour of local and indigenous foods in South Africa. The interviews took place at the immigrants’ homes, their shops, shopping malls, ethnic retail shops and restaurants, traffic intersections (where immigrants gather every morning seeking temporary employment or begging for money from motorists) train and taxi stations, and the Refugee Reception Centre in Maitland. The majority of the interviewees were residents of renowned immigrant communities in the Western Cape Province such as Bellville, Parow, Maitland, Brooklyn, Table View, Mowbray, Rosebank, Rondebosch, De Noorns, Khayelitsha, Gugulethu, Haut Bay and central Cape Town.

**Interviews with executives of major supermarket chains**

With the exception of Pick’n Pay Group Holdings Limited, interviews were held with representatives of Shoprite Group Holdings Limited, Woolworths Group Holdings Limited and Spar Group Holdings Limited. The interviews were aimed at exploring the factors that inhibit South Africa’s leading supermarket chains from catering for the indigenous food products of sub-Saharan African immigrants in South Africa. The author also wanted to establish whether these chains will cater for the needs of the sub-Saharan African immigrant market if their food consumption behaviour pattern is established.

**Interviews with ethnic entrepreneurs**

Nine ethnic entrepreneurs from sub-Saharan Africa also took part in the study. The aim was to deeply understand the indigenous foods consumption behaviour of sub-Saharan African immigrants in South Africa. The author was also interested in exploring the challenges faced by ethnic entrepreneurs in the indigenous foods industry.

**The questionnaire survey**

In addition to interviews, sub-Saharan African immigrants also took part in a questionnaire survey. The questionnaire was carefully designed to achieve similar aims as the interviews. The questionnaire was structured in three parts. Part one looked at the demographic characteristics of the respondents. Part two explored the immigrants’ local food consumption behaviour while part three examined the indigenous food consumption behaviour of sub-Saharan African immigrants in South Africa. Of the 400 administered questionnaires, 236 came back completed - a response rate of 59%.

**Analytical procedures**

In this study, qualitative data was analysed using a Noticing, Collecting and Thinking method. A salient feature of this method is that it is progressive and recursive in that it is a cycle that keeps repeating, and when the author thinks of one thing, new things are noticed, collected and given a deeper thought.

At the noticing stage, the author took note and wrote down salient points made by respondents during the interviews. At the end of every interview, the data was computed according to themes, incidents and topics. By doing this, the author produced a record of the things he had noticed.

At the collection stage, the author sorted and sifted the facts already broken down into manageable pieces. In other words, each appropriate line or section of the data was marked and coded in the margin.

Finally, at the thinking stage, the author examined the data that has been collected with three goals in mind:

a) To make sense out of each collection.

b) To look for patterns and relationships within and across the collections; and

c) To make general discoveries about the phenomena that the author is researching.

Quantitative data was analyzed using Microsoft Excel to establish frequencies and percentages of the variables reviewed. The data analyses involved four stages. In stage one, the author created a workbook that contained the worksheets of the analysis. The database was titled and columns were created and given labels. The first column was labelled as the ID number − where the number of each question was computed. In stage two, the author coded the data, that is, every response was given a number. In stage three, the author entered the responses on the spreadsheet. The ID number was usually entered first, followed by the code of the selected response. The author carefully computed the data to ensure accuracy of the findings. In stage four, the author calculated the frequencies and percentages of the different categories, which were then interpreted to give meaning to the data.
FINDINGS AND DISCUSSION

In the following discussions, the researcher presents the findings of the study; which have been split into three parts to ensure a deeper and clearer understanding of the food consumption behaviour of sub-Saharan African immigrants in South Africa. In part one, the researcher has examined the origin and growth of the sub-Saharan African market in South Africa. Part two explores the food consumption behaviour of sub-Saharan African immigrants in South Africa and in the part three; the author presents some salient features worthy to be considered by major supermarket chains in South Africa intending to invest in the sub-Saharan African immigrant market.

The origin of the sub-Saharan African immigrant market in South Africa

As indicated earlier, the emergence of democratic governance in South Africa has resulted to a mammoth growth of sub-Saharan African immigrants in the country. According to the findings, 69% of sub-Saharan Africans immigrate to South Africa to enhance their living conditions and those of their families back home. According to, 22% of them, movement to South Africa was for educational enrichment while 9% of sub-Saharan Africans immigrate to South Africa due to political instability in their countries of origin.

A regional representation of the respondents uncovered that 27% (n=111) of the immigrants came from Southern Africa (Botswana, Lesotho, Malawi, Mozambique, Namibia, Zambia and Zimbabwe); 26% (n=107) from Central Africa (Angola, Burundi, Cameroon, Gabon, Rwanda and DRC); 24% (n=100) from West Africa (Ghana, Ivory Coast, Niger, Nigeria, Senegal, Sierra Leone and Togo) and 21% (n=91) of the respondents came from the East African countries of Ethiopia, Kenya, Somalia, Tanzania, Uganda and Eritrea.

The food consumption behaviour of sub-Saharan African immigrants in South Africa

In line with the concept of consumer behaviour, the researcher has split the food consumption behaviour of sub-Saharan African immigrants in South Africa into two parts. The first part examines the factors that influence their food, needs choices and desires; while the second part looks at the food decision-making process of the immigrants.

Factors that influence the food needs of sub-Saharan African immigrants in South Africa

The factors have been split into groups. These include personal and social factors.

Personal factors

The personal factors that impact the food consumption behaviour of sub-Saharan African immigrants in South Africa include: gender, marital status, length of residency, education, price, product quality, taste, similarity of local to home products, nutritional benefits, product assortment, service, proximity and employment.

Gender

In this study, 58% of the respondents were males and 42% of them were females. The study uncovered that unlike, their male counterparts, sub-Saharan African females (especially those who are married) consume more indigenous than local foods. Also, when shopping for food, immigrant females from sub-Saharan Africa visit more than one shop to assess the prices and the quality of the products; as well as how similar the products are to those consumed back home.

On the other hand, sub-Saharan African males are more loyal patrons of ethnic restaurants than females. It was found that most males (especially singles) are usually very busy and hardly have time to prepare food, thereby relying on ethnic restaurants for food. Also, for most sub-Saharan African males, ethnic restaurants are social joints and meeting places.

Marital status

Fifty-nine percent of the respondents in this study were singles. Sub-Saharan African immigrants in South Africa who are single spend less on food and eat more often at ethnic restaurants than their married and cohabiting counterparts. Married immigrants constituted 28% of the respondent population.

These immigrants strive to ensure unity in their families by considering the food needs of their family members during groceries. They also act as custodians of their indigenous cultural heritages by ensuring that indigenous foods are mostly eaten by their families. In addition, married immigrants who have lived longer in South Africa have incorporated some traditional local foods on their menus.

Length of residency

In this study, it was found that the majority (59%) of the respondents had lived in South Africa for more than three years. These immigrants have attained a certain degree of familiarity with local foods and consumption patterns. Some traditional local foods such as braai, poitjie, curry and samp have been integrated on the menus of these immigrants.

Forty-one percent of the respondents had lived lesser than three years in South Africa. These immigrants...
consume more indigenous than local foods. According to these immigrants, local foods and consumption patterns are still strange. Most of them rely on ethnic restaurants as their primary source of food. This is because they are still in the process of settling comfortably in the country.

**Education**

The majority (62%) of the respondents in this study had attained at least a high school qualification. This reflects a well educated sub-Saharan African immigrant community in South Africa. However, conventional education has little or no impact on the food consumption behaviour of sub-Saharan African immigrants in South Africa. In other words, their food consumption behaviour is not a characteristic of their level of conventional education. It was found that cultural education (handed down by their parents and/or elders back home) has a greater influence on the food consumption behaviour patterns of most sub-Saharan African immigrants in South Africa. This is expressed in their increasing need for indigenous foods, the evaluation of products stocked by ethnic entrepreneurs and their assessment of the similarity of local to indigenous foods during groceries.

**Employment**

Employment is a very important factor in the food consumption behaviour of sub-Saharan African immigrants in South Africa. It determines their monthly spend on food. Most (52%) sub-Saharan African immigrants in South Africa are self-employed. Self employed immigrants and those who earn a high hourly wage (e.g. managers, teachers, accountants, doctors and lecturers) spend more (up to about R3000) on food monthly. A greater fraction of their monthly spend is on indigenous foods. On the other hand, those who earn a lower hourly wage such as cashiers, sales clerks, cleaners, security guards, and waiters and unemployed immigrants spend less (under R2000) on food monthly. They consume more local than indigenous foods since indigenous foods are perceived to be expensive.

**Price**

The prices of food products determine the food needs of 92% of the respondents in this study. Most sub-Saharan African immigrants (especially females) visit different shops to compare the prices of products during groceries. For the majority of sub-Saharan African immigrants, price accounts for one of the reasons for their loyalty to Shoprite stores. Shoprite is perceived to be cheaper than other leading supermarket chains. Also, most sub-Saharan African immigrants in South Africa would like to buy indigenous products from supermarkets such as Shoprite should these supermarkets stock them. According to them, ethnic enterprises are very pricey and because supermarkets buy in bulk, they will sell at lower prices.

**Quality of product**

For 99% of the respondents in this study, quality plays a very important role in their food consumption behaviour. According to most (55%) consumers of indigenous foods, stocks at ethnic retail shops and restaurants are lacking in quality. South Africa’s leading supermarkets are passionate and commit enormous resources to enhance the quality of their products. Therefore, most sub-Saharan African immigrants would prefer to buy indigenous products from major supermarkets in case they are stocked by supermarkets.

**Taste**

Taste is also a very important element in the consumption behaviour of 96% of sub-Saharan African immigrants. It is used as a benchmark to determine the amount of satisfaction derived from local products since most of the products are strange to them. Sub-Saharan African immigrants also measure the quality of indigenous products stocked by ethnic retailers by their taste since they are familiar with the products.

**Similarity of products**

Seventy-two percent of the respondents in this study assess the similarity of local to indigenous foods during groceries. Since most local products are new to the majority of sub-Saharan African immigrants, evaluating the level of similarity of the products to those back home gives them a sense of the satisfaction to be derived from the products. Patrons of Shoprite supermarket chain maintain that one of the reasons for shopping at Shoprite stores is because the products are perceived to be somewhat similar to indigenous ones.

**Nutritional benefits**

The desire to lead a healthy lifestyle is a special element in the food consumption behaviour of 59% of the respondents in this study. It is one of the reasons why these immigrants shop at Pick ‘n Pay and Woolworths stores. It also explains why most sub-Saharan African immigrants prefer indigenous to local foods. According to them, indigenous foods are organically cultivated.
Product assortment

Most sub-Saharan African immigrants prefer to shop where there is a wide range of products to choose from. According to 52% of them, stocks at ethnic retail shops and restaurants are very limited; hence they would buy indigenous products from supermarkets, should supermarkets stock them. Supermarkets are perceived to offer a broad range of products to their customers.

Reference groups

Reference groups are an indispensable factor in the consumption behaviour of 71% of sub-Saharan African immigrants in South Africa, especially recent immigrants. Reference groups such as immigrant cultural associations dispense valuable information pertaining to indigenous and local foods and consumption ways. From reference groups sub-Saharan African immigrants also learn about the different types of food products, where to find them, prices, and methods of preparation, consumption and disposal.

Proximity

In this study, 79% of sub-Saharan African immigrants patronize shops not far from where they live. It also accounts for one of the reasons why most sub-Saharan African immigrants shop at Shoprite stores. Shoprite is represented in every immigrant community. These immigrants maintain that shopping at close proximity saves time, cost and the inconvenience of travelling by taxi, bus or train to shop at distant places.

Family

The family is an integral part of the food consumption behaviour of many sub-Saharan African immigrants in South Africa. Sub-Saharan African immigrants (predominantly couples) uphold the needs of their family members in their choice of food products. In addition, immigrant families relatively consume more indigenous than local foods since one of the responsibilities of sub-Saharan African immigrant wives is to enforce the cultural heritages of their country of origin. Also, at family events such as birthdays, weddings, funerals, baptisms, graduations and awards, indigenous foods are exclusively served.

Social factors

Social factors such as culture, relationship with South Africans, family and reference groups also greatly determine the food consumption behaviour of sub-Saharan African immigrants in South Africa.

Culture

Cultural values play a significant role in the food consumption process of 82% of sub-Saharan African immigrants in South Africa. According to these immigrants, despite its functional activity, food consumption is endowed with symbolic meanings that govern the social and economic fabrics of their society. This explains why, sub-Saharan African immigrants in South Africa largely prefer indigenous to local foods.

Needs recognition

In this research, it was found that sub-Saharan African immigrants in South Africa consume food products for...
numerous reasons. These include:

a) The need to satisfy hunger.
b) To acquire immense satisfaction from their choice of foods reflected in the benchmarks used in evaluating local and indigenous food products.
c) To fulfill recommendations from friends and relatives (older immigrants).
d) To have a feeling of home (evident in the consumption of indigenous foods).
e) To uphold their cultural values.
f) To sustain relationships with local South Africans.
g) To lead a healthy lifestyle.

Information search

The majority of sub-Saharan Africans immigrate to South Africa with very little or no information on what to expect. At this stage, the most important information is that which can enable the immigrant to evaluate alternatives in order to solve his/her problem. Sub-Saharan African immigrants in South Africa obtain information about different food options from five sources: These include:

a) Friends and/or relatives
b) Ethnic enterprises
c) Immigrant associations such as cultural groups
d) Media
e) Product trials

Evaluating alternatives

According to this study, sub-Saharan immigrants in South Africa are exposed to a broad range of local and indigenous food options. Therefore, in order to ensure that these products are in line with their expectations, these immigrants have established a set of criteria used to evaluate available food options. These criteria include:

a) Quality
b) Taste
c) Price
d) Cultural values
e) Nutritional benefits
f) Service
g) Similarity of products

Making a purchase decision

The evaluation stage is a platform on which sub-Saharan African immigrants in South Africa decide on what food products to buy and where to buy them. At this stage these immigrants make a decision to purchase a food product if the product is perceived to satisfy their needs and those of members of their families (immigrants with families). In some cases, other family members (for example, wife or husband) are also involved in the decision making process.

Post-purchase behaviour

At this stage, sub-Saharan African immigrants in South Africa evaluate the amount of satisfaction derived from a purchase. These immigrants express delight if food products meet their expectations. In this case, most of them continue to buy from the shop. They also spread positive information about the shop and the products to friends and relatives. Equally, if their purchase fails to realize their expectations, these immigrants feel disappointed. In such circumstances, most sub-Saharan Africans refrain from buying the product, switch to other shops and spread negative marketing about the shop and product.

Guidelines for major supermarkets intending to invest in the sub-Saharan African immigrant market in South Africa

It is worthy to note that, South Africa’s leading supermarket chains (Woolworth exclusive) will invest in the sub-Saharan African immigrant market if the food consumption behaviour of the market is established. Equally, the majority of sub-Saharan African immigrants would buy their indigenous foods from supermarkets, should these supermarkets stock them. However, in addition to the food consumption behaviour model, this study uncovered other salient features about the sub-Saharan African immigrant market worthy to be considered by major supermarket chains intending to invest in the market. These include the following:

The immigrants’ monthly spend on indigenous foods

Most (75%) sub-Saharan African immigrants in South Africa spend between R500 to R999 monthly on indigenous foods. The study found that these immigrants may increase their spend on indigenous foods with better quality, affordable prices and increased assortment.

The immigrants’ preferred indigenous foods

The respondents in this study could not resist the delight to mention indigenous food products that they would like to find in South Africa’s major supermarkets. Immigrants from West Africa would like to find yams, maize, cocoyams, cassava, plantains, green banana, sweet potato, millet, sorghum, rice and beans. Most
recipes contain a mixture of fish, meat and vegetables.

East Africans prefer maize, millet, sorghum, green bananas, plantains, lentils, rice, pepper, cassava, sweet potato, beans and leafy vegetables such as spinach and cabbage.

Immigrants from Central Africa would like to eat plantains, cassava, peanuts, pepper, cocoyam, rice, palm oil, potato, maize, sorghum, millet, green bananas and a variety of vegetables such as green, okro and enu.

While South Africans prefer crops such as sorghum, maize (corn), pumpkin beans, leafy greens (for example, spinach and cabbage) potato, rice, cassava, banana and beans. Influences from the Indian and Malay community can be seen in the use of curries, sambals, pickled fish, fish stews, chutney, and samosa. European influences can be seen in cuisines like biltong (dried beef stripes), potjies (stews of maize, onions and tomatoes).

Challenges encountered by ethnic entrepreneurs

Trading in food products from sub-Saharan African countries in South Africa entails numerous challenges which according to this study, are important for South Africa's leading supermarket chains to know and understand before investing in the market. These chains may devise appropriate measures to overcome the challenges prior to investing in the indigenous market. These challenges include:

a) The difficulty of obtaining travel documents of countries of supplies.
b) The possibility of acquiring sub-standard quality products due to suppliers’ inability to enforce the quality of their produce.
c) The difficulty of importing perishable products to South Africa due to Government’s stringent regulations and the cost involved.
d) Intense competition in the industry due to increase in the number of ethnic entrepreneurs in South Africa.

The significance of ethnic retail shops and restaurants

Though the weaknesses of ethnic entrepreneurs (poor quality products, high prices, limited products and poor customer service) have compelled most sub-Saharan African immigrants to believe that major supermarket chains would effectively meet their expectations of indigenous products, ethnic retail shops and restaurants play a fundamental role in the welfare of sub-Saharan African immigrants in South Africa. They perform the following functions:

a) They provide indigenous food and non food (for example, clothing, jewelry, magazines, videos, and cultural artifacts) products.
b) They instill a feeling of home. According to most sub-Saharan African immigrants in South Africa, a visit to ethnic enterprises is metaphorically considered a visit back home. This is because, the layout of the stores, presentation of products and the multiple types of verbal lore that circulate within these shops are reflections of home.
c) They are social hubs and a conduit of folklore. At ethnic enterprises, sub-Saharan immigrants meet friends, relatives and other immigrants from their countries with whom they share not only cultural knowledge but also new world experiences.

Thus, it is important for South Africa’s supermarket chains to understand not only the chemistry of indigenous products but also the psychology of the immigrants and the sociology of immigrant groups and networks.

Conclusion

This study has established a food consumption behaviour model of sub-Saharan African immigrants in order for South Africa’s major supermarket chains to establish measures to cater for their indigenous food needs. The model is split into two parts, which are (a) the factors that influence the food needs, choices and desires of the immigrants; and (b) the stages in their food decision making process. It is important to highlight that South Africa’s major supermarket chains will invest in the sub-Saharan African immigrant market with the creation of a food consumption behaviour model of the immigrants. Equally the majority of sub-Saharan African immigrants believe that leading supermarket chains in South Africa will meet their expectations of indigenous foods. In addition to the model, the study uncovered other important features about the sub-Saharan African immigrant market that must be considered by leading supermarket chains. If given adequate consideration, these features may facilitate investment in the sub-Saharan African immigrant market in South Africa. These features include (a) the immigrants monthly spend on indigenous foods (b) their preferred indigenous foods (c) challenges encountered by ethnic entrepreneurs and; and (d) the significance of ethnic enterprises.

REFERENCES


Full Length Research Paper

Applying KM matrix and LCA theory to organizational development

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The purpose of this study is to examine how knowledge management has been applied in the business development life cycle. In addition, a proposed knowledge matrix is utilized in conjunction with a production pipeline. This study discusses three of the four different business life cycle stages and their related strategies. Life cycle analysis (LCA) theory is adopted in both the organizational development and knowledge management stages. The knowledge involved in running a business can be represented as a strategic resource which can help to enhance competitive advantage. However, this advantage will be eroded if the company does not continually update its knowledge. Several interesting findings are discussed in this study, such as how globalization affects the profit efficiency of firms implementing different knowledge management strategies. Moreover, this work will also consider which form of knowledge management is most important at different stages of the life cycle of a business. The contribution of this study is that it investigates whether the life cycle of the business plays a role in the use of activity-based costing, quite apart from the actual size of the business. Earlier studies report that the use of activity-based costing increases along with the size of firms. However, although those businesses in the maturity and revival phases of their life cycles are often larger than firms in a growth phase, not all of them can be considered as large companies. A case study of the Taiwanese company that sells golfing products to global market is examined, and several useful strategies are presented for managers.

Key words: Knowledge management, life cycle analysis, organization development.

INTRODUCTION

Business success is enhanced by successful knowledge management, but the knowledge-based competitive advantages obtained by companies are in need of continuous updating (King and Marks, 2008). Henri et al. highlight that technological and market knowledge should have a different effect on exploitative versus exploratory innovations and on project autonomy (Burgers et al., 2007). However, how to bring out the optimal effects of knowledge management and gain the related benefits still remains a matter of debate (Kjargaard and Kautz, 2008). This study attempts to understand which stages of the knowledge management (KM) cycle should be applied in each stage of the business development life cycle. As illustrated in a range of industries, strategic advantages depend on how organizations mobilize, combine and create knowledge.

In advanced industrial economies, this is not only transforming knowledge into high value-added products, but seeing knowledge as a core of almost every activity of the firm. This has long been self-evident in new and hi-tech industries, such as biotechnology, nanotechnology or robotics where knowledge fuels innovation. In addition, it is well-acknowledged that in established industries, such as construction or aerospace, that upgrading knowledge of design and production processes is essential for continuous improvement. As for the film and entertainment industries, the status of mathematicians

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and computer programmers is gaining an unprecedented importance. Ever-changing technologies, economic trends and regulatory regimes leave organizations struggling for any advantage they can gain in such a competitive business environment (King and Marks, 2008). Managers thus face a central dilemma: organizations are becoming increasingly reliant on knowledge at a time when knowledge-based advantages are eroding more rapidly than ever.

In response to this problem, many organizations have put increasing emphasis on specific projects as vehicles to increase their strategic advantages. Such projects are not only capable of addressing market discontinuities more rapidly than most other organizational processes, but also capable of creating revolutionary new products and services that can offer more competitive advantages. In knowledge-based environments, strategic advantages revolve around the role that projects play in exploiting and enhancing the knowledge base of the firm. But to do so effectively, these must go beyond the specific aims for which they are designed. In effect, they must also become sites and opportunities for the creation, mobilization and integration of knowledge. Finally, an OEM golf product manufacturer in Taiwan with four products in its pipeline is utilized to illustrate the concepts proposed in this work.

LITERATURE REVIEW

Here, the definition of KM will be discussed, and three phases of the four phases of the KM life cycle are investigated in greater detail. Firms in the growth phase put emphasis on growth and on expanding their market share, whereas firms in the maturity and revival phases clearly put more emphasis on minimizing production costs in mature, highly competitive markets, rather than on growth. This is because increased competition decreases the profitability of the firms in the latter two stages, and thus cost-effectiveness and profitability are more important. Consequently, firms in the maturity and revival phases focus more on formal cost controls, as they need to produce products efficiently and earn adequate profit margins in a more challenging market. Maturity and revival firms experience increased diversification in their products and markets. Increased diversification in products, markets and competition causes businesses to put more emphasis on reducing, controlling and understanding the factors driving their costs than in the growth phase.

Therefore, mature and revival firms can be expected to use activity-based costing, as this should help managers to better understand cost hierarchies and relevant revenues, and thus to achieve better financial performance. Second, the life cycle analysis (LCA) literature suggests that the organizational size of a firm is greater in the maturity and revival phases than in the growth phase. As Chenhall and Langfield-Smith point out, greater organizational size leads to greater complexity of tasks, and this requires more division of labor (Chenhall and Smith, 1998). The specialization of tasks leads to more extensive differentiation, that is similar tasks are grouped within common units. As a result, it becomes more difficult to ensure that organizational subunits are acting towards the achievement of a common purpose. More sophisticated integrative mechanisms, such as information systems, are then developed to coordinate the activities of subunits. Management accounting innovations, such as activity-based costing are examples of such systems. In addition, firms in the maturity and revival stages, due to their greater organizational size, have more resources to experiment with administrative innovations, such as advanced management accounting systems. In sum, greater organizational size and access to more resources can be expected to lead to more widespread use of activity-based costing among firms in the maturity and revival stages of their life cycle, as opposed to firms in the growth stage.

Third, the LCA literature suggests that firms in the mature and revival stages have more centralized, formal and bureaucratic organizational structures, as opposed to those in the growth stage. Moreover, organizations that adopt activity-based costing are more centralized and more formal, and thus more likely to be associated with the implementation of activity-based costing in comparison to decentralized and less formal ones (Ooi, 2009). And they also find that organizations that adopt and implement activity-based costing are more bureaucratic than those that do not. It follows from these results that the use of activity-based costing should also be more common among firms in the maturity and revival phases than those in the growth phase.

Definitions of knowledge management

The knowledge possessed by a business represents a strategic resource that can create competitive advantages (Naris and Ukpere, 2010). A firm’s knowledge is the result of years of organizational activity in which the tacit and explicit knowledge of individuals is combined into a collective whole (King and Marks, 2008). Table 1 summarizes the definitions of KM that have appeared in the literature between 1994 and 2006. Several scholars define KM as a framework, while others see it as a tool to refine business processes to reach specific objectives. The current study will define KM as processes with different goals in the different business development stages, known as knowledge capture, knowledge sharing, and knowledge integration. All three of these will be discussed in more detail subsequently.

Maier (2004) defines KM as going far beyond the storage and manipulation of data, or even of information. Sabherwal and Sabherwal, (2005) define KM as doing what is needed to get the most out of knowledge
resources, and thus it is about organizing and making available important knowledge, wherever and whenever it is needed. Sarvary (1999) define KM as a business process, noting that it the method by which firms create and use their institutional or collective knowledge. In their view KM includes three sub-processes: 1) organizational learning, 2) knowledge production, and 3) knowledge distribution. Sousa and Hendriks (2006) define KM as the policies, strategies, and techniques aimed at supporting an organization’s competitiveness by optimizing the conditions needed for efficiency improvement, innovation, and collaboration among employees. Hult (2003) defines KM as the organized and systematic process of generating and disseminating information, and selecting, distilling, and deploying explicit and tacit knowledge to create unique value that can be used to achieve competitive advantage in the marketplace. Zarraga and Falcon (2003) claim that KM can be conceptualized as a process whose input is the individual knowledge of a person, which is created, transferred and integrated in work teams within the company, while its output is organizational knowledge, a source of competitive advantage. Chait (1999) defines KM as a multidimensional process. It requires the effective concurrent management of four domains: 1) content, 2) culture, 3) process, and 4) infrastructure. Morgan et al. (2003) define KM as concerning an organization’s ability to develop and utilize a base of intellectual assets in ways that impact the achievement of strategic goals. Wiig (1994) defines KM as a conceptual framework that encompasses all activities and perspectives required to making the organization act intelligently on a sustained basis. KM includes activities to gain an overview of, deal with, and benefit from the areas that require management attention by identifying salient alternatives, suggesting methods for dealing with them, and conducting activities to achieve desired results. Alavi and Leidner (2001) define KM as identifying and leveraging the collective knowledge in an organization, to help the organization compete in the marketplace. In addition, they claim that KM is largely regarded as a process involving various activities, at a minimum, the four basic processes of creating, storing/retrieving, transferring, and applying knowledge. Ruggles (1998) notes that KM is a term that has now come to be used to describe everything from organizational learning efforts to database management tools. Finally, O’Leary (1999) defines KM as the formal management of knowledge for facilitating the creation, access, and reuse of knowledge, typically using advanced technology.

### Knowledge capture

Projects often create new knowledge, which is in different forms depending on how it is embodied in new products and services, how it is designed into new processes, or how it is institutionalized in new practices (King and Marks, 2008). This new knowledge may be created either directly from the project or indirectly through the organizational learning. For example, a new microchip design may sell well in the market, but it may also represent a significant advance in the firm’s own technological knowledge. New organizational knowledge can also emerge unexpectedly during a project. Solutions and ideas developed by team during a project management process may contribute to developing useful routines for the firm (Quinn and Cameron, 1983).

For instance, the project management expertise can embody competencies in managing a project or improve the organizational co-ordination capabilities with project members. The role of projects in knowledge capture is well demonstrated in this management process. Ordanini et al. (2008) provide an example of organizational knowledge capture by showing how experience working on projects in Italy, yielded new knowledge with regard to co-ordination, which was then used to facilitate project planning and implementation in other markets.

### Knowledge sharing

Bartol and Srivastava (2002) define knowledge sharing as the action in which employees diffuse relevant information to others across the organization. According to Bock and Kim (2002), knowledge sharing is the most important part of KM. The ultimate goal of employees’ sharing knowledge is its transfer to organizational assets and resources. Additionally, sharing activities have to be voluntary and cannot be forced. Consequently, the means by which knowledge is shared within organizations and the factors that facilitate knowledge sharing are core issues in KM. Indeed, the terms knowledge sharing and knowledge transfer are often used interchangeably in the literature, and the research on knowledge sharing has emphasized the collective character of knowledge emerging from interaction and dialogue among individuals.

In order to analyze knowledge sharing in more detail, the properties of knowledge have to be taken into account. Because the existing knowledge is not always sufficient, businesses often have to mobilize and absorb knowledge from the environment. This mobilizing activity may be directly related to business requirements, and

### Table 1. KM implementation matrix.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Introduction</th>
<th>Growth</th>
<th>Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture</td>
<td>Urgent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharing</td>
<td>Urgent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration</td>
<td>Urgent</td>
<td></td>
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</tbody>
</table>
thus managers engage in a search for crucial knowledge inputs as part of their efforts to meet project goals. For example, businesses mobilize knowledge through individuals that become members of a project team. Team members may be recruited for their recognized skills and identifiable knowledge, but in the process of becoming part of the project they may also demonstrate valuable knowledge and expertise that had not been previously recognized by the organization. Examples of knowledge mobilization here include those studied by Burgers et al. (2007) which followed a project in which existing products were modified using licensed technology. In a similar vein, Ordanini et al. (2005) showed how the adoption of projects to launch new music at EMI, allowed different parts of the organization to mobilize useful knowledge; and Arroyabe and Arranz, (2002) analyzed technology-knowledge networks, especially the aspects relating to management control via empirical verification.

Knowledge integration

Argote’s (1999) research on organizational learning shows knowledge is retained in three different memory systems: 1) individual memory, 2) an organization’s information technologies and tools, and 3) its structures and routines. Project implementation often requires combining skills and ideas from disparate sources. In many instances, this combination is short-term and project-specific. In other words, knowledge is combined to serve the goals and deliverables of the project, but is thereafter allowed to disperse. In some instances, however, the combination produces a synthesis that is of long-lasting value to the organization.

For organizations, this does not only result in breaking down boundaries between bodies of expertise that were previously isolated from each other, but also prevents organizations from going through endless cycles of having to learn anew how to combine these bodies of expertise when the need arises. Because the knowledge base of large organizations is segmented (Quinn and Cameron, 1983), one role which projects often play is to enable the integration of knowledge between different sub-units. Burgers et al. (2007) provide a useful example of knowledge integration by highlighting the role of new business projects in integrating technological markets and technological knowledge. Ivory and Vaughan (2006) likewise examine the problems of knowledge integration; however, in their case the problems arise because producers and customers often start with different conceptions of product design and performance. Integration therefore has to begin with a clear understanding of how each group “frames” the project, and what key knowledge areas require careful management. Finney (1983) examines a similar problem of knowledge integration, but in the context of film development. Here producers, directors and writers have different conceptions of what the final film script will look like, and their disagreements often result in project failure.

Finally, Newell et al. (1983) examine some of the problems of knowledge integration at an inter-organizational level. They show how regulatory, clinical and commercial knowledge is dispersed across different projects and different organizations in the biomedical sector. Innovation therefore depends on combining and integrating these disparate bodies of knowledge. As the authors describe, this integration effort is inevitably hampered by organizational and disciplinary boundaries. Mariano (2003) establishes links and seeks connections between the contributions made to the study of innovatory phenomena and he analyzes the evolution undergone by studies on the topic of the technological innovation process. The role which projects play in accessing knowledge is not confined to activities within the business alone. Projects are situated within a web of relationships which may extend well beyond functional or organizational boundaries. Some projects do operate entirely within the organization, but others represent a joint undertaking among organizations. Similarly, projects may be unique, or they may have an explicit relationship to past and future projects.

METHODOLOGY

Here, three of the four stages of the business development life cycle are discussed. The ontological and epistemological assumptions of the study are informed by the interpretive paradigm, and accordingly the team members’ pipeline are understood as active constructors of meaning, as well as active interpreters of reality. This study divides the life cycle of KM into three phases, 1) capture, 2) sharing and 3) integration. The capture phase is when a firm retrieves existing knowledge from the operating process and then stores it in a knowledge base. The sharing phase means employees to share their personal, tacit knowledge. Finally, the integration phase is when the refined knowledge is filtered from the business process. Within these three phases of KM, another dimension, with four stages, (introduction, growth, maturity and decline), represents the life cycle of business development. This dimension is also referred to as the product life cycle theory. Therefore, the KM implementation matrix (Table 1) is designed to explore the KM life cycle in any project.

Organizational life cycle theorists (Quinn and Cameron, 1983) suggest that the characteristics of an organization will change along with the product life cycle. In the birth stage of the latter cycle, the prime distinguishing feature of firms is that they are small size and have greater flexibility, a flatter organizational structure, and faster responsive ability. For this reason, the birth stage is also referred to as an ‘entrepreneurial stage’. The founders of these firms are technically or entrepreneurially oriented, preferring to keep management activities to a minimum. Instead, they devote their efforts to developing and selling new products, and they rely on a minimal amount of information in decision-making. The growth stage occurs once the business has established its distinctive competences and has achieved some initial product-market success. In this stage, firms are characterized by rapid sales growth. Growth firms rely more on formal rules and procedures to ensure organizational and administrative efficiency. This is due to the expansion of activities and products, and their increasingly
centralized structures. Some authority is delegated to middle-managers, who devote greater efforts to collecting and processing the information needed in decision-making. Growth firms extend their product ranges, but this usually results in a more complex array of products for a given market rather than more positions in widely differing markets (Miller and Friesen, 1984).

The maturity stage follows the growth stage as sales stabilize and the rate of innovation falls. In the maturity stage, the administrative task of the business becomes more complex, which in turn leads to more formal and bureaucratic structures. In fact, Quinn and Cameron (1983) define this stage as the ‘formalization and control stage’. Mature firms place more emphasis on efficiency, profitability and strategies, rather than on innovations. Decision-making is dominated by a few key managers and structures remain centralized. In the revival stage, firms adopt divisionalized structures for the first time to cope with the more complex and heterogeneous markets that they are operating within. Revival firms focus their strategies on diversification and expansion of product-market scope to achieve turnaround and attain new growth. They also emphasize more sophisticated control and planning systems. A summary of the characteristics of firms in different life cycle stages is presented as follows.

A few recent studies have applied the Miller and Friesen typology (Miller and Friesen, 1984) to the life cycle stages of businesses in connection with management accounting. Auzair and Smith (2005) examine the life cycle stage of the business, using a self-categorization measure proposed by Kazanjian and Drazin (1990), and report that organizational life cycle, among other contingent variables, has a significant effect on the design of a firm’s management control systems. Davila (2005) reports that the size and age of the firm, the replacement of the founder as CEO and the existence of outside investors are drivers of the emergence of management control systems. Finally, Moores and Chenhall (1994) explore the use of management accounting systems at different life cycle stages and find that the formality of the management accounting systems varies with time. The knowledge stages and business development life cycle matrix, presented in Table 1, is used to better understand what the most important strategy is in each stage.

The introduction stage

The introduction stage is at the beginning of the product development life cycle. Businesses in this stage are always smaller than in later stages, and all of the relevant knowledge is hidden, in the development of the product or in personal experiences. The most important action in this stage is to create or store knowledge for future use, ideally by codifying it. Using information technology (IT) or information systems (IS), is thus helpful in speeding up this routine work and making it more effective.

Most of the measures of organizational culture suggest that larger cultural differences exist in partnerships, so as to not yield win-win outcomes. However, at the same time, these differences are not significant.

The growth stage

The product life cycle literature implies that there are several reasons why the use of advanced management accounting systems, such as activity-based costing, is greater among firms in the maturity and revival phases than during the growth phase. These are due to differences in the administrative tasks, business environment, strategies and organization structures between firms in different life cycle phases.

The maturity stage

The maturity stage comes after the growth stage, when the administrative tasks of the business become more complex, which in turn leads to more formal and bureaucratic structures. In addition, at this stage sales are stable and the level of innovation usually falls. In this stage, mature firms place more emphasis on efficiency and profitability and on strategies, rather than on pursuing innovations.

Although firms in the maturity and revival phases are often bigger than those in the growth phase, not all of them are necessarily large. In other words, even small firms are likely to use activity-based costing, if they have a managerial need for an advanced cost-accounting system, due to where they are in their life cycle stage. Maturity firms also experience increased diversification in their products and markets, and the complexity and density of both these also rises. In this stage, businesses need more knowledge to handle all the business processes, and thus extracting extract knowledge from the existing routine processes is a necessary and urgent task.

CASE STUDY

The golf industry flourished from 1980 to 2000 in Taiwan, but due to the twin influences of inflation and economic depression, it is now in decline. Over the past 15 years, the golf industry has grown substantially, and is expanding in a manner consistent with the most optimistic projections. When compared with sales in other industries, those in the golf industry in Taiwan reached 62 billion NTD in 2005. Companies that purchase golf heads need to place orders three months in advance to keep up with production schedules from golf product manufacturers. O-Ta is one of the biggest golf product manufacturers in Taiwan, it was founded in 2006. It offers various products to downstream firms, primarily of four different types: 1) wood, 2) iron, 3) wedge and 4) putter. In 2007, O-Ta had about 20, 18, 15, and 13% market share for each of these products, respectively, in the US market.

The matrix shown in Table 1 is applied into O-Ta’s products in this study. Figure 1 shows O-Ta’s revenues from 1999 to 2008. It includes four pipe lines and all side products that the company produces. This study divides the firm into four business development stages. Each stage is discussed as follows. A number of authors have studied the sharing of a resource between several agents. The literature on bankruptcy problems is also extensive, such as works by O’Neill (1982), Aumann and Maschler (1985), and Thomson (2003). Here this study will not discuss this situation further because of the lower contribution. From 1999 to 2003, the first five years studied, O-Ta was in the introduction phase, and the revenue gradually increased. During this period, mass production was the main strategy that O-Ta followed, with the aim of achieving economies of scale and improving production performance.

In this stage, O-Ta utilized a titanium technique which was established to help boost their performance in 1999. In 2000, O-Ta was officially listed in the OTC market, and
the firm’s assets increased at the same time. To reduce operating costs, O-Ta closed the factory that it rented in Swatow and bought a new factory in O-Ta, China, enabling it to improve production performance to better meet the needs of customers, which duly increased market share. In 2001, O-Ta enlarged their new factory in China, and work on this was finished in November in 2002. At the same time, the firm increased its assets to 7.451 billion NTD at the same time. In this phase, knowledge was captured from the firm’s alliances and vendors, such as the techniques and requirements for mass manufacturing its products.

Meanwhile, for the next stage, O-Ta made preparations to become an ODM firm, learning how to design products such as golf club heads and graphite shafts, as well as the techniques of golf club assembly. In this stage, all of O-Ta’s strategies were related to economies of scale and mass manufacturing, and most of its knowledge came from customers and vendors. Consequently, little knowledge came from inside the firm, and knowledge sharing and knowledge integration were not key aims. In 1999, titanium was introduced into golfing products, and O-Ta began to focus all of its resources to produce related products.

In the beginning of this period, there was only one boiler in O-Ta’s factory, which could produce 2,000 titanium wood club heads every day, although 6,000 were required. O-Ta had to outsource these excess orders, and thus it decided to invest in more boilers to increase its production capability. In addition, O-Ta changed its production line to make other titanium-related golfing products. These changes increased both the economies of scale that the firm achieved and the profits that it made. In 1999, titanium related product accounted for 30 to 50% of O-Ta’s total production. O-Ta’s total profits for that year was 1.554 billion NTD, and sales in the American market was around 300 million NTD.

To obtain more capital to follow its expansion plans, in 2002 O-Ta decided to become a listed company, raising 534 million NTD. O-Ta also decided to move some of their business to China in 2003, to take advantage of the lower labor costs, and in 2005 the firm had about 1,500 employees in China and 266 in Taiwan. In 2001, O-Ta’s capital reached 616.9 million NTD, and it invested two subsidiaries. The investment ratio between China and Taiwan at this time was 6 to 4.

In 2003, to improve the quality of its products and international business image, O-Ta began to utilize the ISO verification system. Before using the ISO system, all management processes were unrecorded, and the firm had no formal training system too. In addition, many contracts were unsigned, being only oral agreements. After applying the ISO system, all of the processes at O-Ta became documented and standardized.

Besides improving the quality of production, this step also enabled more accurate forecasting. Two subsidiaries were established in the same year, responsible for researching, developing and designing new materials and products, in order to increase competitiveness. The second stage was from 2003 to 2005, and these three years were the firm’s growth phase. O-Ta’s revenues increased dramatically in this period, as they captured more market share.

The firm thus decided to set up their research and development team to improve their product and service quality, and these became their main objectives. O-Ta passed the SGS UKAS ISO 9001:2000 quality management system in 2003, and set up two more subsidiary companies, Dia Company and INDA Company. In 2004, O-Ta formed a customer service team to improve communication with customers and thus raise satisfaction. In this phase of the firm’s life cycle, knowledge was shared inside the company. Most of O-Ta’s profits came from manufacturing, and they captured knowledge from outside of the company and integrated it into their designs.

Consequently, some of the vendors started to ask for ODM services, and thus began another stage in the firm’s

Figure 1. O-Ta’s revenues from 1999 to 2008, in US $.
evolution. In 2005, the global market for golfing products began declining, and O-Ta thus hoped to reduce its manpower while still achieving the same level of performance. In Taiwan, O-Ta cut some production lines and reduced staff numbers by 79. In order to sustain the quality and capacity, O-Ta applied the TOYOTA Producing System (TPS). The effect of utilizing TPS was to shorten producing process, reduce the number of staff (from 7,610 to 6,237), factory space (cut by about 3,880 m²), and inventory (by about 25%). In this phase, O-Ta started to plan its future as an ODM, and thus its main objective was not to capture knowledge from customers and vendors, but rather to share existing knowledge between the parent company and the two subsidiary companies.

The third stage of the firm’s development was from 2005 to 2007, which is the maturity phase. At this time the market was fully saturated, and so O-Ta could only hope to improve its internal processes, by reducing costs and increasing performance. Therefore, O-Ta applied TOYOTA Producing System (TPS) to its manufacturing process in 2005. In 2007, the firm started to integrate its existing knowledge and techniques to apply for patents. In addition, their assets reached 1.207 billion NTD. In this phase, O-Ta still made money from manufacturing and design, but the company began to make plans to exploit related sidelines, like golfing tours.

In this stage, O-Ta demonstrated the importance of knowledge integration, and also prepared for the next, declining stage. In 2007, the R&D department of O-TA and its subsidiary developed many new products and obtained 25 patents in 2007, and 23 in 2008. Four of these new patents were for golf wood heads. In 2008, because of global economic slowdown, the golf industry faced serious declines in sales. Moreover, as its factory in China had to agree to new labor contracts, its salary costs increased. With a fall in revenues and a rise in costs, O-Ta’s profits declined substantially in 2008. In addition to exploring gold-related sidelines, O-Ta also moved into the growing bicycle market, moving into the OEM business in 2009, and developing their own brand, Volando.

DISCUSSION AND CONCLUSION

Life cycle research suggests that the use of management accounting systems depends on the specific stage of the organizational life cycle, as different systems are needed in different stages (Miller and Friesen, 1984). In comparison with growth firms, the administrative tasks of maturity and revival firms are more complex, they need to produce products/services cost-effectively, to earn adequate profit margins in highly competitive markets, experience increased diversification in their products and markets have greater organizational size, and more formal and bureaucratic organizational structures.

Consequently, the use of the advanced cost-accounting systems such as activity-based costing should be more common among maturity and revival firms than among growth firms. In this paper, we investigate the issue of whether the use of activity based costing varies in different life cycle stages.

In this paper, we have considered organizational identification as a key point in compliance with organizational KM initiatives. A managerial contribution of this study is to note that managers could use the rich empirical data presented here to guide employees towards complying with KM initiatives, even in the light of the inevitable tensions created by contexts such as dual organizational identification. Three findings of this work are as follows. Firstly, conceptual difficulties limit the development of a common vocabulary among members of the KM research community—“Unfortunately, it appears that knowledge is often formed from bonds that are hard, that knowledge that are hard to understand from the inside looking out.”

Secondly, KM is an interdisciplinary research area in which the references most frequently cited by the information systems researchers are from the management rather than information systems literature. Finally, KM is in the early definitional or theory-building stage of being a discipline. KM researchers still have to “build their field anew--- first principles, justification of concepts, questions and methods.” It is estimated that the high value products were consumed before they were regained. Besides, China market is emerging gradually. Especially after the financial tsunami, the developed country operates the financial goods in leverage, and they win the backfire. As China markets are conservative. The influences of financial tsunami were smaller than other country. Although economic growth rate was not as good as past, it was growing up still. After the financial tsunami, China market has more opportunity and the market of Korea, India, Southeast Asia and emerging countries where many business opportunities could be expected.

REFERENCES


A comparative study of the relationships between multiple intelligences and general self efficacy among public and private organizations in Maragheh, Iran

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Multiple Intelligences is closely related to the organizational affairs. By developing multiple Intelligences and studying its effects on general self-efficacy, we will have employees more compatible in every sophisticated and complicated issue. By investigating these kinds of relationships, managers will consider the importance of multiple intelligences and general self efficacy. This paper will review the literature of both in general because of its importance.

Key words: Multiple intelligences, general self-efficacy, public and private organization, Maragheh.

INTRODUCTION

Definition of intelligence

For many years, intelligence has been one of the most controversial concepts (Eysenck and Kamin, 1981). This concept, like many other concepts in psychology, is not well defined.

Psychologists have not reached an agreement on what intelligence is (Valsiner and Leung, 1994).

Although, intelligence is a possession prized by most people, the term has no objective, agreed-upon referent either among the general public or contemporary psychologists.

Characteristics such as age, weight, or height in individuals have proper referents, but we cannot point to a single observable characteristic of a person to indicate his or her intelligence (Kail and Pelligrino, 1985). The problem resides in the fact that intelligence is an abstract concept. It does not have any tangible, exact and physical basis. Intelligence is a general concept for a group of processes which are inferred from people's explicit behaviors and responses. For example, we can observe the problem solving strategies and measure the result of using such strategies precisely, but intelligence which is supposed to create such techniques is not observable (Moafian, 2008).

However, there have been lots of attempts to define intelligence. According to Kline (1991), “intelligence is popularly defined as the ability to learn, understand and deal with novel situations. The intelligent person is seen as quick-witted, acute, keen, sharp, canny, astute, bright and brilliant. At the other end of the scale, the unintelligent person is described as dim, dull, thick, half-witted or stupid”.

Multiple intelligence theory

Gardner's theory has a very solid biological basis. In this theory, the brain has been taken into account as a major physical determinant of intelligence. By studying individuals who had speech impairment, paralysis or
other disabilities, Gardner could find the parts of the brain that were specialized to perform the specific physical functions. He compared the rains of people with disabilities with those who did not have a disability and found that in the disable people there was damage in specific areas. In his studies, Gardner found seven different parts of the brain; as a result, in his theory, he suggested seven different intelligences including musical, mathematical, linguistic, spatial, kinesthetic, interpersonal and intrapersonal, each associated with a specific area of the human brain. Later, Gardner added the eighth one, naturalist, to his list of multiple intelligences (Gardner, 1995; Hosseini, 2003; Noruzi and Gholam, 2010).

Gardner’s multiple intelligent theory posits that human beings possess at least eight intelligences, to a greater or lesser extent. They are as follow (Armstrong, 2009):

Once this broader and more pragmatic perspective was taken, the concept of intelligence began to lose its mystique and became a functional concept that could be seen working in people’s lives in a variety of ways. Gardner provided a means of mapping the broad range of abilities that humans possess by grouping their capabilities into the following eight comprehensive categories or “intelligences”:

**Linguistic**
This is the capacity to use words effectively, whether orally (for example, as a storyteller, orator, or politician) or in writing (for example, as a poet, playwright, editor, or journalist). This intelligence includes the ability to manipulate the syntax or structure of language, the phonology or sounds of language, the semantics or meanings of language, and the pragmatic dimensions or practical uses of language. Some of these uses include rhetoric (using language to convince others to take a specific course of action), mnemonics (using language to remember information), and explanation (using language to inform), and met language (using language to talk about itself).

**Logical-mathematical**
This is the capacity to use numbers effectively (for example, as a mathematician, tax accountant, or statistician) and to reason well (for example, as a scientist, computer programmer, or logician). This intelligence includes sensitivity to logical patterns and relationships, statements and propositions (if-then, cause-effect), functions and other related abstractions. The kinds of processes used in the service of logical-mathematical intelligence include categorization, classification, inference, generalization, calculation and hypothesis testing.

**Spatial**
This is ability to perceive the visual-spatial world accurately (for example, as a hunter, scout, or guide) and to perform transformations upon those perceptions (for example, as an interior decorator, architect, artist or inventor). This intelligence involves sensitivity to color, line, shape, form, space and the relationships that exist between these elements. It includes the capacity to visualize, to graphically represent visual or spatial ideas, and to orient oneself appropriately in a spatial matrix.

**Bodily-kinesthetic**
Expertise in using one’s whole body to express ideas and feelings (for example, as an actor, a mime, an athlete, or a dancer) and facility in using one’s hands to produce or transform things (for example, as a craftsperson, sculptor, mechanic, or surgeon). This intelligence includes specific physical skills such as coordination, balance, dexterity, strength, flexibility, and speed).

**Musical**
The capacity to perceive (for example, as a music aficionado), discriminate (for example, as a music, critic), transform (for example, as a composer), and express (for example, as a performer) musical forms. This intelligence includes sensitivity to the rhythm, pitch or melody, and timbre or tone color of a musical piece. One can have a figural or “top-down” understanding of music (global, intuitive), a formal or “bottom-up” understanding (analytic, technical), or both.

**Interpersonal**
This is the ability to perceive and make distinctions in the moods, intentions, motivations and feelings of other people. This can include sensitivity to facial expressions, voice and gestures; the capacity for discriminating among many different kinds of interpersonal cues; and the ability to respond effectively to those cues in some pragmatic way (for example, to influence a group of people to follow a certain line of action).

**Intrapersonal**
This has to do self-knowledge and the ability to act adaptively on the basis of that knowledge. This intelligence includes having an accurate picture of oneself (one’s strengths and limitations); awareness of inner moods, intentions, motivations, temperaments, and desires; and the capacity for self-discipline, self-understanding, and self-esteem.
Naturalist

This has to do with expertise in the recognition and classification of the numerous species—the flora and fauna—of an individual's environment. This also includes sensitivity to other natural phenomena (for example, cloud formations, mountains, etc.) and, in the case of those growing up in an urban environment, the capacity to discriminate among inanimate objects such as cars, sneakers, and CD covers (Noruzi and Gholam, 2010).

Self-efficacy

Self-efficacy was defined by Albert Bandura as a person's belief in their capability to successfully perform a particular task. Self-efficacy theory is an important component of more general social cognitive theory, which suggests that an individual's behavior, environment, and cognitive factors (that is, outcome expectations and self-efficacy) are all highly inter-related. Bandura (1978) defined self-efficacy as "a judgment of one's ability to execute a particular behavior pattern." Wood and Bandura (1989) expanded upon this definition by suggesting that self-efficacy beliefs form a central role in the regulatory process through which an individual's motivation and performance attainments are governed. Self-efficacy judgments also determine how much effort people will spend on a task and how long they will persist with it. People with strong self-efficacy beliefs exert greater efforts to master a challenge while those with weak self-efficacy beliefs are likely to reduce their efforts or even quit (Bandura and Schunk, 1981; Brown and Inouyne, 1978; Schunk, 1981; Weinberg et al., 1979; Staples et al., 2005; Sariolghalam and Noruzi, 2010b).

It is a person's belief in their capability to successfully perform a particular task. Together with the goals that people set, self-efficacy is one of the most powerful motivational predictors of how well a person will perform at almost any endeavour. A person's self-efficacy is a strong determinant of their effort, persistence, strategizing, as well as their subsequent training and job performance. Besides being highly predictive, much is also known about how self-efficacy can be developed in order to harness its performance enhancing benefits (Heslin and Klehe, 2006; Noruzi and Gholam, 2010).

METHODOLOGY AND INSTRUMENTS

This project has been done by two questionnaires with high reliability and validity among 350 (202 Male and 148 Female) employees in public and private organizations in Maragheh.

General self-efficacy

The general self-efficacy scale is a 10-item psychometric scale that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life. The scale has been originally developed in German by Matthias Jerusalem and Ralf Schwarzer in 1981 and has been used in many studies with hundreds of thousands of participants. In contrast to other scales that were designed to assess optimism, this one explicitly refers to personal agency, that is, the belief that one's actions are responsible for successful (Schwarzer, 2006; Sariolghalam and Noruzi, 2010a).

Multiple intelligence developmental assessment scale (MIDAS) questionnaire

To measure teachers' multiple intelligence, multiple intelligence developmental assessment scale (MIDAS) questionnaire was used, which consists of one hundred and nineteen (119) questions about eight intelligences which are mentioned in Gardner's multiple intelligence theory. In this questionnaire, a number of questions for each intelligence are stated in Appendix 1.

The results of factor analysis revealed that the questionnaire measures eight hypothetical constructs (Shearer, 1996; Hosseini, 2003).

Research questions

1). Is there significant relation between employees' multiple intelligences and self-efficacy among public and private organizations of Maragheh?
   a). Is there significant relation between employees' musical intelligences and self-efficacy among public and private organizations of Maragheh?
   b). Is there significant relation between employees' kinesthetic intelligences and self-efficacy among public and private organizations of Maragheh?
   c). Is there significant relation between employees' musical intelligences and self-efficacy among public and private organizations of Maragheh?
   d). Is there significant relation between employees' spatial intelligences and self-efficacy among public and private organizations of Maragheh?
   e). Is there significant relation between employees' linguistic intelligences and self-efficacy among public and private organizations of Maragheh?
   f). Is there significant relation between employees' interpersonal intelligences and self-efficacy among public and private organizations of Maragheh?
   g). Is there significant relation between employees' intrapersonal intelligences and self-efficacy among public and private organizations of Maragheh?
   h). Is there significant relation between employees' naturalist intelligences and self-efficacy among public and private organizations of Maragheh?

Data analysis

To assess normal distribution, descriptive statistics was applied. To determine the relationship between employees' multiple intelligences and general self-efficacy, Kendall's tau-b test was used. Gender roles and the tendency to check the critical thinking and student self-efficacy, independent t test were used.

RESULTS

Table 1 shows the results of descriptive statistics for the two instruments – multiple intelligences and self-efficacy questionnaires - used in the study.
Table 1. Summary of chi-square tests and research hypotheses.

<table>
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<tr>
<th>Independent and dependent variable</th>
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<td>General self efficacy and multiple intelligences</td>
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<td>0.000</td>
<td>Significant</td>
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<td>Kendall's tau-b</td>
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<td>-</td>
<td>0.000</td>
<td>Significant</td>
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<td>General self efficacy and kinesthetic Intelligences</td>
<td>Chi square</td>
<td>100.9</td>
<td>4</td>
<td>0.000</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Kendall's tau-b</td>
<td>0.42</td>
<td>-</td>
<td>0.000</td>
<td>Significant</td>
</tr>
<tr>
<td>General self efficacy and logical Intelligences</td>
<td>Chi square</td>
<td>107.5</td>
<td>4</td>
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</tr>
<tr>
<td></td>
<td>Kendall's tau-b</td>
<td>0.48</td>
<td>-</td>
<td>0.000</td>
<td>Significant</td>
</tr>
<tr>
<td>General self efficacy and spatial Intelligences</td>
<td>Chi square</td>
<td>68.2</td>
<td>4</td>
<td>0.000</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Kendall's tau-b</td>
<td>0.38</td>
<td>-</td>
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</tr>
<tr>
<td>General self efficacy and linguistics Intelligences</td>
<td>Chi square</td>
<td>132.6</td>
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</tr>
<tr>
<td></td>
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<td>0.51</td>
<td>-</td>
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</tr>
<tr>
<td>General self efficacy and intrapersonal Intelligences</td>
<td>Chi square</td>
<td>64.2</td>
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<tr>
<td></td>
<td>Kendall's tau-b</td>
<td>0.30</td>
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<td>Significant</td>
</tr>
<tr>
<td>General self efficacy and interpersonal Intelligences</td>
<td>Chi square</td>
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<td>0.002</td>
<td>Significant</td>
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<td></td>
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<td>-</td>
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<td>General self efficacy and naturalistic Intelligences</td>
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<tr>
<td></td>
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<td>0.36</td>
<td>-</td>
<td>0.000</td>
<td>Significant</td>
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</tbody>
</table>

As Table 1 shows, there are significant relationships between multiple intelligences and general self-efficacy. It also reveals that every dimension of multiple intelligences has meaningful relationships with general self-efficacy also. And the degree of relationship understood from the Kendall's tau-b in the Table 1 shows the intensity of the relationship between two factors that is, dependent and independent variables and also the Chi square, and the degree of freedom related to the significance of variables that is, the two variables are significant or not.

**DISCUSSION AND IMPLICATIONS**

As a manager who has a good multiple intelligences, multiple intelligences and general self-efficacy, general self-efficacy can cope with the market and organizational facts well than others who do not have more. So a manager who has a good multiple intelligence can manage the situation and run the business more successfully than the others too (Noruzi and Gholam, 2010).

The Table 1 revealed that there is significant relationship between multiple intelligence and general self-efficacy and also among dimensions of multiple intelligence and general self-efficacy. It is logical in the real world because if someone has a high intelligence then he/she can manage the situation better and will have better ability to develop the organization to higher ranks and this will lead to self-efficacy in employees. In the following, we bring some practical steps to help the developing of both multiple intelligence and general self-efficacy in the organization.

**Some practical guides for developing multiple intelligences and general self-efficacy**

1. Holding purposeful seminars and workshops for development of both multiple intelligences and general self-efficacy.
2. Managers should train employees but it should be responsive to and guided by intellectual standards (relevance, accuracy, precision, clarity, depth, and breadth).
3. General self-efficacy should be developing via intellectual factors of the employee with self-discipline.

4. Because the thinker can identify the elements of thought present in workshop or meetings and they want to make logical connection between the elements and the problem at hand so the feedback is highly needed.

5. Managers should help the employees in both public or private in self-assessing and self-improving.

6. The employees should know why they learn multiple intelligences strategies or general self-efficacy affairs. They should know that learning these strategies will help them to be improved.

7. The multimedia training and learning in the sleep strategy will increase employees general self-efficacy and managers can use from that strategy also (Noruzi and Jose, 2010).

REFERENCES


### Appendix 1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Musical</th>
<th>Kinesthetic</th>
<th>Mathematic</th>
<th>Spatial</th>
<th>Linguistic</th>
<th>intrapersonal</th>
<th>intrapersonal</th>
<th>Naturalist</th>
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<td>13</td>
<td>17</td>
<td>15</td>
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<td>9</td>
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</table>
The process to affect entrepreneurship: The example of tourism in Taiwan

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Entrepreneurship is always an interesting topic of study for both entrepreneurs and scholars. For some reasons, most research on entrepreneurship focuses only on individuals or enterprises. Nevertheless, entrepreneurship needs to consider industry-wide or country levels of influence. The influence of entrepreneurship can cover all of society and the whole country. This study uses the data from tourism to explain how the process generates entrepreneurship in Taiwan. The process contains data taken from external and internal factors related to globalization, government, market structure, and market resources. This study will describe in detail the influence and relationship of each factor. Furthermore, tourism has become a very common topic of discussion in Taiwan, promoting it is a core policy practiced in recent years by the government. The process of entrepreneurship has encouragingly promoted the development of tourism, as well as creating an entrepreneurial society in Taiwan.

Key words: Entrepreneurship, Taiwan, tourism, globalization, government, market structure, market resources.

INTRODUCTION

Entrepreneurship has long been a field of interest for scholars and enterprises as a research topic. It is an important field required to understand a key part of social science. The research field of entrepreneurship has been expanded to a country-wide level, not just focusing on individuals. For example, some national market structures and economic contexts such as in the United States, Israel, and Canada have been found to encourage entrepreneurship more than those found in countries such as Denmark, Finland, and France (Reynolds et al., 1999). Thurik (1999) provided an empirical evidence from 1984 to 1994 cross-sectional study of the 23 countries that are part of the Organization for Economic Co-operation and Development (OECD), that increased entrepreneurship, as measured by business ownership rates, was associated with higher rates of employment growth at the country level. Entrepreneurship has promoted social structure with more integrity in many countries.

However, for a field of social science to have usefulness, it must have a conceptual framework that explains and predicts to set of empirical phenomena not explained or predicted by conceptual frameworks already in existence in other fields. To date, the phenomenon of entrepreneurship has lacked such a conceptual framework (Shane and Venkataraman, 2000). Shane and Venkataraman have given us the inspiration and motivation to construct such a process for entrepreneurship. Scholars already have carried out in-depth research on the relationship between factors and entrepreneurship. We adjusted the key factors and the sequences related to entrepreneurship based on different studies. Figure 1 represents a theoretical depiction of our viewpoint. Globalization and government have powerful influences leading to changes of the market structure. Market resources are dependent on the needs of the market structure. Each factor will be discussed in each area with arguments obtained from previous studies and our own researches.

This study will use tourism as an example. As a consequence of rapid development, tourism has become a very important theme for discussion in the Republic of
Figure 1. Process to affect entrepreneurship.

China, Taiwan. In the past, the government has focused on the development of manufacturing and the high-tech industry; however, the rise of China and Southeast Asia brings strong threats and extreme competition. Taiwan has no advantages in manufacturing or the high-tech industries, due to increasing labor costs. However, the decline of an industry may be a chance for another industry to rise. At this point, tourism is in a position to stimulate domestic economic prosperity. The market has begun to rely on high quality and professional service, to produce a service oriented economy. This study will use the official data from 1990 to 2010 to analyze the change within this period which include globalization, government, market structure, market resources and entrepreneurship. We will discuss each factor related to entrepreneurship with an example using Taiwan’s tourism and literature review.

GLOBALIZATION

Globalization and government play the two critical roles affecting global and regional environments in terms of cooperation and competition. These different roles interact and their influence will change the market structure. It is hard to determine which side has the most right or justice to do this. We discuss our first factor in this area. Milanovic gives an appropriate definition for globalization. According to Milanovic (2003), globalization being such a huge and multifaceted process presents different faces to different people. Depending on where we live, whether we are rich or poor, where we stand ideologically, we are bound to see the process differently.

Although the meaning of globalization has always been used to the trend of the world, the meaning of globalization is defined differently in different studies. According to Smeral (1998), globalization means an increase in the international division of labor, achieved through the international fragmentation of production, as well as the political trend towards a more liberal world economic order. He also indicates that globalization has been related to ideas of political, economical, and cultural dependencies. In the early 1990s, the term globalization was little used. By 2000, no speech was complete without it. However, globalization is much more. It includes political, technological, and cultural forces. It is more than a description. It is an ideology that defines basic expectations about the roles and behaviors of individuals and institutions (Kettl, 2000). Globalization has two faces: the benign one, based on voluntary exchanges and free circulation of people, capital, goods and ideas; and the other face, based on coercion and brute force (Milanovic, 2003).

If globalization is a trend, market competition is an inevitable circumstance. Increased globalization has rendered markets more volatile as a result of competition from a greater number of foreign rivals (Brock and Evans, 1989). Some markets will suffer cruel shocks and disruption from exposure to this type of competition; however, some markets will benefit from globalization. Our social environment has changed and been deeply affected by globalization. Despite the increasing wave of
Table 1. Growth rate of visitor arrivals.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of visitors</th>
<th>Growth rate (%)</th>
<th>Visitor expenditures (Thousand US$)</th>
<th>Growth rate (%)</th>
<th>Spending per person (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>5,567,277</td>
<td>26.67</td>
<td>8,719,000</td>
<td>27.92</td>
<td>1,566</td>
</tr>
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<td>2009</td>
<td>4,395,004</td>
<td>14.30</td>
<td>6,816,000</td>
<td>14.82</td>
<td>1,550</td>
</tr>
<tr>
<td>2008</td>
<td>3,845,187</td>
<td>3.47</td>
<td>5,936,000</td>
<td>13.85</td>
<td>1,430</td>
</tr>
<tr>
<td>2007</td>
<td>3,716,063</td>
<td>5.58</td>
<td>5,214,000</td>
<td>1.52</td>
<td>1,403</td>
</tr>
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<td>2006</td>
<td>3,519,827</td>
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<td>4,977,000</td>
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<td>-24.50</td>
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<td></td>
<td>1,740,000</td>
<td></td>
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Globalization, entrepreneurial activity (as measured by the business ownership rate) began to increase by the mid-1970s in the United States, a period consistent with the acknowledged beginnings of the globalization era (Ghoshal et al., 1999; Gilbert et al., 2004). Therefore, globalization can also bring opportunities to some regions or some industries.

The development of technology and traffic has changed the structure of tourism, as the distance between nations has lessened and they have pulled closer to each other. Tourism has also benefited from the growth of population following the baby boom and increased concerns with a leisure life. In the year 1970, Europe and the Americas together had almost 94% of international tourist arrivals. In 1995, their share in world tourism had decreased to 79%. The market share of the Americas shrank 3.5% points and Europe lost 11% points, while East Asia and the Pacific have gained almost 12% points since 1970 (Smeral, 1998). From Smeral’s study, we can see that globalization has brought increased competition to Europe and the Americas; however, East Asia and the Pacific have benefited from globalization. The market share of tourism has changed rapidly being transferred from Europe and the Americas to East Asia and the Pacific. Opportunity has followed the footsteps of globalization to East Asia and the Pacific.

Taiwan is one of the nations located in East Asia. Globalization has changed the structure of the industry and stimulated the growth of tourism in Taiwan. From the years 1990 to 2010, the total number of visitors has increased from 1.9 million to over 5.5 million people (Table 1). This is a 187% growth rate. Over these last two decades, global and regional economies have suffered in the Asian Financial Crisis which occurred in 1997 to 1998, in the early 2000s from the recession which led to the collapse of the Dot-com bubble, and the recession in the late 2000s recession with a commodity boom and the bursting of the housing bubble. In these periods of economic recession, the total number of still visitors continued to increase for most of the time.

In Taiwan, a total of one million people arrived in 1976. It took eighteen years to reach two million visitors. However, it took only eleven years to reach a total to three million, four years to reach four million, and only one year to reach five million visitors. Globalization accelerates the exchange of people and products. Globalization plays a critical role affecting the substantial growth in visitors. From Table 1, it is seen that the only thing that cause a significant drop in the total number of visitors was disease in 2003. At that time, Taiwan was impacted by severe acute respiratory syndrome (SARS). The impact of natural disasters on tourism has determined that they do significantly affect the tourism industry (Chu, 2008; Wang, 2009).

Globalization and foreign tourism growth can, in fact, increase the amount of foreign trade and availability of
products in the national economy, thereby stimulating further production (Sugiyarto et al., 2003). From Table 1, it can be seen that visitor expenditures have increased from 1,740 to 8,719 million dollars, a growth rate in excess of 401%. The rate of visitor expenditures has also shown a double digit increase in the most recent three years. During this period, the economic recession has not had a significant impact on visitor expenditures for tourism. For the same reasons as earlier stated, the only factor that had a significant effect on visitor expenditures was the SARS scare in 2003 which resulted in a decrease in the total number of visitors that year. Visitors to Taiwan spend on average 1,400 to 1,600 dollars per person.

The increase in foreign tourism demand will create more production and employment (Sugiyarto et al., 2003). The growth in the number of foreign visitors will affect the development of tourism. Both regional and national economies will prosper due to visitor expenditures. Globalization has advanced the development of tourism in Taiwan, and it has encouraged market transactions. Globalization can provide opportunity to the market; however, it is not enough to rely only on this. Although globalization is an essential factor for entrepreneurial activities, government also has a critical influence on entrepreneurship.

GOVERNMENT

In addition to the effects of globalization, government policy can decide the degree of entrepreneurship. According to Acs and Szerb (2007), the implication for policy makers at all levels of government likewise is very clear: If they want to promote entrepreneurship, they must think globally rather than locally or even nationally. The roles between globalization and government are like a shepherd and a leading sheep, a relationship of mutual influence.

Government policy can influence the allocation of entrepreneurship effectively (Baumol, 1990; Bowen and De Clercq, 2008). According to Minniti (2008), entrepreneurship is the mechanism through which economic growth takes place, but policy environment are what allocate entrepreneurial efforts toward productive or unproductive activities by influencing the relative incentives and payoffs offered by the economy to such activities. Also, Puia and Minnis (2007) suggest that the regulation of entry is particularly important for entrepreneurship, as country with more entrepreneurship tends to be associated with lower levels of entry regulation. Government policy has the power to influence entrepreneurial activity. Government can create favorable entrepreneurial environments by using effective policies. Entrepreneurship policies tend to be based on a handful of policy tools. Among them are financing, taxation, regulations on trade, and encouragement of innovation activities (Minniti, 2008). Acs and Szerb (2007) suggest that policy area should include trade, immigration, technology, and foreign policy. Lee and Peterson (2000) consider that societal factors such as cultural, economic, political, and social forces can combine to create threats or opportunities in the environments. Smeral (1998) also suggests that governments can improve or harm the competitive position through economic policy, labor market policies, and education, research policies. Policies should consider different natural environment and different historical backgrounds. There is no best policy for any government, because policy should change with different conditions and epochs. In Taiwan, government policy has deeply affected the development of tourism. The most important policy to affect this change is foreign policy. At different times of foreign policy, major sources of tourists have followed by its change.

In order to analyze data more specifically, the total visitors have to be divided by the different purposes of their visits; including for business, tours, visiting relatives, attending conferences, study, and so on. Visiting for the purpose of tourism usually make up between 30 and 45% of the whole. It always comprises the first or second largest share of total visitors, the other being for business. Even in the last three years, tourism has increased from 46 to over 58%. As seen in Table 2, Japan, Hong Kong and Macao have been the major source of tourists for a long time. There has been no big change in the percentage of visitors from America and Europe. However, visitors from China have increasingly chosen Taiwan as their traveling destination since 2008, and it quickly became a very important source for tourism. In 2010, China became the largest source of tourists for Taiwan's tourism industry.

The year 1895 was the first watershed for Taiwan, because it was then that the island nation was ceded to Japan and placed under Japanese rule from 1895 to 1945. Before this year, Taiwan was one of the districts of China, ruled by the Qing Dynasty. In this fifty year period, many Japanese had been appointed to or immigrated to Taiwan, and they started to seek leisure locations. Ximending is one of the places that was planned and designed by Japanese for this purpose. Ximending is located in the western part of Taipei City. The Japanese followed the example of Asakusa in Tokyo to set up an entertainment and business area. The Beitou hot springs area is a natural resource which is located in northern Taipei City. The Japanese modeled the facilities in this area after the example of Izu hot springs in Shizuoka for rest and relaxation. As a consequence of this long relationship with Japanese culture and construction, Japanese people feel they are familiar with Taiwan.

After the Second World War, the control of Taiwan was returned to China. In order to prevent the communist threat in the Asia Pacific area, Taiwan and Japan started to gradually develop a friendly and cooperative
relationship. The Japanese can easily apply for tours to Taiwan, and the distance between the two nations is very close. Foreign policy has opened Taiwan as a destination for Japanese tourists, and the influence of historical factors also promotes tourism. Therefore, foreign policy has caused Japan to become one of the largest source of tourists for a long time.

The year 1949 is the second watershed for Taiwan, because of the Chinese Civil War. As a consequence of the war between the Chinese Nationalist Party (also called the Kuomintang, KMT) and the Communist Party of China, China and Taiwan separated forming two governments. After the retreat of the KMT from China to Taiwan in 1949, martial law was implemented, continuing from May 20, 1949 to July 15, 1987. Under martial law, Taiwan and China treated each other as enemies for over thirty-eight years. China started to permit Taiwanese to visit China for the purpose of visiting relatives in November 1987. Taiwan also announced application procedures for Chinese to visit Taiwan in 1993, but the government limited the conditions and numbers. Also, applicants needed to pass through a third country to Taiwan. Many applicants choose Hong Kong or Macao to be that third country.

The situation and foreign policy between China and Taiwan has been improved in the recent years. Both governments have decided to work towards the goal of cooperation and peace. Taiwan began to allow Chinese to apply for tourist purpose and allow airlines to flying directly back and forth in July 2008. China has become the fastest growing country providing tourists, and contributed over 23% of the total number of tourists in 2009 and nearly 38% in 2010. Sharing the same language and culture, Chinese treat Taiwanese similar to their family. As a result, Chinese choose to visit places based on cultural and historical factors. The National Palace Museum is one of the most popular destinations for Chinese tourists. The collection of Chinese cultural artifacts held by the museum is very large. In order to prevent damage to these items during the civil war, the museum sent the most valuable collections from China to Taiwan before 1949.

Government policies can affect entrepreneurship through short and long term development. Policies aimed at promoting entrepreneurship or influencing relevant factors will be effective in the long run. Policies need to be designed to take into account local and national differences, and to adapt to the different scale and nature of existing resources and market capabilities. According to Acs and Szerb (2007), policy makers across all levels of government should not only have a strong interest in promoting entrepreneurship directly, but should also consider the impact their decisions on a range of issues are likely to have on entrepreneurial activity. In Taiwan, tourism has benefited from both globalization and government by providing opportunities and policies to promote the growth of tourism. With the influence from both globalization opportunities and governmental policy, entrepreneurial activity will be stimulated to adapt a new market structure.

### MARKET STRUCTURE

More entrepreneurship is better than less for societies.
around the world. Also, entrepreneurs are able to seize new opportunities in the face of environmental barrier (Lee and Peterson, 2000). Entrepreneurship does not necessarily start with a product or service to sell. It starts with an opportunity, and opportunities are rooted in the external environment (Morris, 1998). Moreover, the external environment can include economic, political, and social forces that provide the broader context for the organization’s operations (Covin and Slevin, 1991). The change of external environment will affect the movement of the entrepreneurs, and that will also change market structure toward a new one.

The interaction between globalization opportunities and governmental policy will affect the original market structures and create new ones. The change of the market structure is a change in supply and demand. Globalization opportunities and governmental policy provide the demand, and entrepreneurs create the supply. Entrepreneurs can anticipate the demand and create the supply within a market. When a market needs more suppliers to satisfy the consumer, entrepreneurs will undertake the responsibility to create supply in the face of uncertainty. Therefore, a change of market structure can be seen from the movement of the entrepreneurs.

Small and medium-sized organizations can adapt more easily to changes in the environment because of their more manageable size (Li and Matlay, 2006; Mazzarol and Reboud, 2006). Historical data for small and medium enterprises (SMEs) shows that they can observe the change of market structure. It should be noted that this especially true in Taiwan since more than 75% of its employment is derived from working in SMEs. Table 3 shows the classification of major SMEs reflecting market structure from 1990 to 2010. Although the total number of SMEs continued to increase in these decades, the data reveal a significant reduction in number of manufacturing firms, decreasing nearly 10% in twenty years. Previous studies have shown that, Taiwan’s manufacturing SMEs have played an important role in promoting trade, creating jobs, and developing certain industries (Hu and Schive, 1998; Hu, 1999). With the impact of globalization and government, labor costs have created a disadvantage for manufacturing firms. Large manufacturing firms have the ability to move into developing countries with lower labor costs. Small and medium sized manufacturing firms have been restricted by government policy and forced to increase labor costs.

Unlike manufacturing firms, other industries have seen stable growth at the same period. The percentage of construction firms has increased from 3.33 to 7.57%. Commercial firms still have the largest share of SMEs, with percentages of between 58 and 62. In order to obtain a more specific classification, commerce is separated into two parts: wholesale and retail, and accommodation and restaurants after 2002. From 2003

Table 3. Changes in SMEs by different industries.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of SMEs</th>
<th>Manufacturing (%)</th>
<th>Construction (%)</th>
<th>Wholesale and retail (Commerce, %)</th>
<th>Accommodation and restaurants (%)</th>
</tr>
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<tbody>
<tr>
<td>2010</td>
<td>1,247,998</td>
<td>10.42</td>
<td>7.57</td>
<td>51.77</td>
<td>9.39</td>
</tr>
<tr>
<td>2009</td>
<td>1,232,025</td>
<td>10.55</td>
<td>7.51</td>
<td>52.13</td>
<td>9.21</td>
</tr>
<tr>
<td>2008</td>
<td>1,234,749</td>
<td>10.68</td>
<td>7.47</td>
<td>52.51</td>
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<td>2007</td>
<td>1,236,586</td>
<td>10.78</td>
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<td>10.64</td>
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<td>15.03</td>
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<td>15.57</td>
<td>6.34</td>
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<td>16.45</td>
<td>6.06</td>
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<tr>
<td>1993</td>
<td>901,768</td>
<td>17.16</td>
<td>5.33</td>
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<tr>
<td>1992</td>
<td>871,726</td>
<td>17.90</td>
<td>4.38</td>
<td>59.96</td>
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<td>1991</td>
<td>825,556</td>
<td>18.66</td>
<td>3.83</td>
<td>60.20</td>
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<tr>
<td>1990</td>
<td>794,834</td>
<td>19.53</td>
<td>3.33</td>
<td>59.77</td>
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</table>
Table 4. Changes in tourism hotels.

<table>
<thead>
<tr>
<th>Year</th>
<th>International Tourist Hotel</th>
<th>General Tourist Hotel</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Occupancy (%)</td>
</tr>
<tr>
<td>2010</td>
<td>68</td>
<td>68.88</td>
</tr>
<tr>
<td>2009</td>
<td>64</td>
<td>63.89</td>
</tr>
<tr>
<td>2008</td>
<td>61</td>
<td>66.04</td>
</tr>
<tr>
<td>2007</td>
<td>60</td>
<td>68.55</td>
</tr>
<tr>
<td>2006</td>
<td>60</td>
<td>70.38</td>
</tr>
<tr>
<td>2005</td>
<td>60</td>
<td>73.33</td>
</tr>
<tr>
<td>2004</td>
<td>61</td>
<td>66.22</td>
</tr>
<tr>
<td>2003</td>
<td>62</td>
<td>57.43</td>
</tr>
<tr>
<td>2002</td>
<td>62</td>
<td>61.63</td>
</tr>
<tr>
<td>2001</td>
<td>58</td>
<td>62.02</td>
</tr>
<tr>
<td>2000</td>
<td>56</td>
<td>64.85</td>
</tr>
<tr>
<td>1999</td>
<td>56</td>
<td>61.29</td>
</tr>
<tr>
<td>1998</td>
<td>53</td>
<td>62.51</td>
</tr>
</tbody>
</table>

To 2010, the part held by accommodation and restaurants increased nearly 2%. This growth is related with the development of tourism.

From the demand side, globalization and government have promoted a growth in total number of visitors, and new tourists have come to visit Taiwan from different countries. From the supply side, the market needs to provide more basic facilities to satisfy visitors, such as hotels, restaurants, transportation, shopping, and entertainment options. The change in the number of tourist hotels can be described as an example of the supply side. In Taiwan, international tourist hotels and general tourist hotels are the two major types of facilities that can be chosen by tourists. From 1998 to 2010, the number of international tourist hotels increased from 53 to 68, and the number of general tourist hotels also increased from 23 to 36 (Table 4). Over these thirteen years, the occupancy of international tourist hotels was maintained at over 61%, except during the SARS epidemic in 2003. The occupancy of general tourist hotels can always be kept at over 55%.

Time and capital are critical for the hotel business. The planning of a tourist hotel takes two to three years or more. Business owners need to consider the current environment and to predict future demand for this high risk industry. Entrepreneurs saw a high occupancy rate from 2004 to 2007, and they treated this change as an opportunity. Also, opening the market to tourists from China has provided a significant chance for entrepreneurs. A high occupancy rate has been a benefit of the large number of Chinese tourists in 2010. From government estimates, the hotel market will add 22 international tourist hotels and 7 general tourist hotels from 2011 to 2016. Entrepreneurs must see the opportunities that arise from globalization and policy from government to provide for future demand.

Globalization opportunities and governmental policy have opened new supply and demand for tourism. Both data from SMEs and tourist hotels can prove the change in the market structure. The development of entrepreneurial activities is paramount requiring large demand and an active supply to create a new market structure. From this point, entrepreneurship can be affected by globalization opportunities and governmental policy, and entrepreneurial activities can be developed in response to changes in the market structure. Nevertheless, entrepreneurship is unreachable if integration with suitable market resources is lacking. The next area will explain how market resources respond to changes in market structure for tourism.

MARKET RESOURCES

Peteraf and Bergen (2003) generalize the conceptualization and interpretation of resources from the point of view of resource-based theory. First, resource substitution conditions not only the sustainability of a competitive advantage, but the attainment of competitive advantage as well. Second, resource scarcity should be assessed in terms of resource functionality rather than resource type. Third, the value of a resource derives from its application in product markets. Forth, the effect of resource substitution on the sustainability of advantage is not a mere echo of the effect of imitation. Also the definition of resource from scholars, resources that are valuable, rare, inimitable and non substitutable make it possible for business to develop and maintain competitive advantages, to utilize these resources and competitive advantages for superior performance (Collis and Montgomery, 1995; Barney, 1991; Grant, 1991; Wernerfelt, 1984).
Market resources will be affected by changes in market structure. The usage of coal and petroleum is an example. When people began to rely more on oil related products, the importance of petroleum to the general public exceeded that of coal. Unlike the enterprise level, industry and country need a stronger degree of reliance on resources, especially the difference in amount. Resources are necessary to sustain competitive advantage to industry and country level. The role of market resources is a way to connect demand with supply and to reach entrepreneurship. According to Conner (1991), entrepreneurship is an intricate part of the resource-based framework.

Barney (2001) defined resources as the tangible and intangible assets a firm uses to choose and implement its strategies. Market resources can also be defined as the natural and human resources used for industry and country. Natural resources are the raw materials that need to be discovered and exploited by industry and country. Human resources are comprised of a group of people that need to be trained and educated by industry and country. Natural resources are location dependent, but human resources depend on the institution. Natural resources may limit the development of industry and country in a specific field; however, human resources can support the development of industry and country in a specific field. Therefore, if the industry and country have no significant natural resources, they need to focus on the development of human resources.

Taiwan was named Formosa by the Portuguese, being a beautiful island with plains in the west, mountains in the middle, and an attractive coastline facing the Pacific Ocean in the east. Although Taiwan has beautiful scenery, this is not enough to support the development of tourism. In order to service an influx of tourists, the structure of human resources needs to shift. Human resources comprise not only the labor force but also the knowledge force. Knowledge is an important index to evaluate variation of human resources. When industry and country need more knowledgeable people in specific discipline, the structure of human resources will be directed to strengthen this specialized field.

Tourism requires injecting knowledge-based human resources to enhance their service, especially people with knowledge related to tourism. However, knowledge-based human resources are difficult to calculate with numbers. According to Audretsch and Feldman (1996), knowledge is inherently different from traditional factors of production, such as land, labor, and capital in that it is uncertain, asymmetric, associated with greater transactions costs, and, as a result, more difficult to evaluate. Education may provide evidence for researchers to evaluate the number of knowledgeable people in specific fields. Twenty years ago in the early 90s, the number of people who received associate or bachelor degrees related to tourism was small, only one thousand per year, less than 1% of total graduates. Ten years ago, this number rose to almost four thousands per year nearly 1.5% of total graduates. In the last year, over ten thousand students received degrees related to tourism nearly 4% of total graduates. These students have knowledge about tourism and have become important human resources to the industry.

The variation of occupational structure can also help to describe changes in market structure and market resources. One of the most common occupations for tourism is the tour guide. When visitors travel around a foreign country, they need a tour guide who can speak both native and foreign language with knowledge needed to explain the culture and scenery within an area. The change in the number of tour guides can indicate the prosperity or decline of tourism. Government statistics show that the number of tour guides with certification granted by the authorities rose to over two thousand in 1995, reaching three thousand in 2004. The number of tour guides jumped to five thousand a growth rate of over 60% by 2005. In order to satisfy the current and future needs, the number of tour guides has seen a great increase from 2005 to 2010. The total number of tour guides was fifteen thousand in 2009 and twenty thousand in 2010.

The change in a market structure will change the usage of market resources. Tourism needs support not only from natural resources, but also from human resources. With each structural change, knowledge required to obtain that level of sophistication changes. The result is generally a greater need for human capital, which has given rise to the increase in knowledgeable workers. Knowledge-based human resources are part of market resources and can create an entrepreneurial environment. According to O’Connor and Ramos (2006), skills and knowledge, motivational attitudes, and cognition were found to be important parts of entrepreneurial capacity. Entrepreneurship can contribute to economic growth by serving as a mechanism that permeates the knowledge filter (Acs and Szerb, 2007). Moreover, the role of the entrepreneurial sector changed when industrial comparative advantages shifted toward knowledge-based economic activity (Audretsch and Thurik, 2001).

**ENTREPRENEURSHIP**

The largest obstacle in creating a conceptual framework for the entrepreneurship field has been its definition. Most researchers have defined the field solely in terms of who the entrepreneur is and what he or she does (Venkataraman, 1997). If the definition of entrepreneurship focuses only on individuals, its importance will be greatly reduced. Entrepreneurship is much more than its definition. It is a context-dependent social process (Low and Abrahamson, 1997).

The field of entrepreneurship is centrally concerned
with understanding how opportunities bring into existence future goods and services that are discovered, created, and exploited, by whom, and with what consequences (Venkataraman, 1997). According to Alvarez and Busenitz (2001), entrepreneurship is about cognition, discovery, pursuing market opportunities, and coordinating knowledge that lead to heterogeneous outputs. They also indicated that entrepreneurship theory has tended to focus on heterogeneity in beliefs regarding the value of resources. In regards to the entrepreneurial role, it is the decision to direct inputs into certain processes rather than into other processes. Entrepreneurship involves what Schumpeter termed the new combinations of resources (Schumpeter, 1934; Kirzner, 1979; Alvarez and Busenitz, 2001).

Entrepreneurship is a process comprising all of the positive factors in every stage. Entrepreneurship needs opportunities and policies from both foreign and domestic interaction to push the change of market structure. Moreover, new market structure needs different valuable resources than old past structures. According to Louhij and Glynn (2001), entrepreneurship is reinforced by the broader institutional structures of a society. Entrepreneurship can be seen as a successive positive correlation within a process of social change. It is accompanied by the dreams and hopes to change the lives and change the future toward an entrepreneurial society.

Entrepreneurship has long been considered a significant factor for socioeconomic growth and development because it provides job opportunities, offers a variety of consumer goods and services, and generally increases national prosperity and competitiveness (Zahra, 1999). In Taiwan, globalization opportunities and government policies promote the development of tourism, and they also stimulate the transaction on capital and goods. Accommodation and restaurant have benefited from the growth of tourists. Human resources have tended toward knowledge related to tourism. All of these changes create a prosperous society with entrepreneurship.

Conclusion

This study creates a conceptual framework on entrepreneurship. The idea of our conceptual framework is based on part of Porter’s model (Porter, 1990; Smeral, 1998; Davies and Ellis, 2000), competitive advantage of nations or called national diamond. From national diamond, the role of chance is a certain status to change the industry condition and environment. The role of government is through policy instruments to change the industry competitive advantage. From these factors, we believe that globalization and government have the powerful influence and ability to create a new market structure. According to Smeral (1998), the demand conditions are determined by the size and the structure of the market. The factor conditions are given through factor endowments which are natural and cultural resources, capital and infrastructure resources, and human resources. We define demand conditions as the market structure and factor conditions as the market resources.

The value of entrepreneurship represents the ability to face uncertainty and to adapt to change. Entrepreneurship advances from opportunities derived from globalization and policy from the government. When these actions promote the change of market structure and promote the usage of market resources, the social phenomenon of entrepreneurship will promote the healthy development of a country. The process of entrepreneurship is a key to push society toward a new evolution.

This study uses the evidence of tourism to illustrate our framework. In the past, manufacturing and the high-tech industry symbolized entrepreneurship in Taiwan because they created the Taiwan economic miracle. High growth in job opportunities and GDP promoted a wealthy and prosperous society. Nevertheless, the threat from globalization and changes in government policy caused them to lose their original advantage. However, the decline of one industry may be a chance for the rise of another industry. At this point, the symbol of entrepreneurship transfers to a developing industry, tourism. The whole society and country has focused on tourism, and it will continue to grow for years or decades to come.

In the future, we hope that more examples from many other industries and countries can be gathered to support the process of entrepreneurship. Different industries and countries must have their own unusual stories. Every change and opportunity can stimulate the activities of entrepreneurship toward entrepreneurial society. Entrepreneurship is an endless process used to achieve future hopes and dreams.

REFERENCES

Chu FL (2008). A fractionally integrated autoregressive moving average
Perspective on entrepreneurial development through banking industry: Strategic management on inflation rate currently affecting South African Reserve Bank (SARB)

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Despite the fact that South Africa is well financially resourced, there are disturbing reports on the dilemma the South African Reserve Bank (SARB) is said to face relating to the inflation rising. This paper looks into and describes those possible causes of this predicament against entrepreneurship and argues that the SARB appears to fail to optimally apply and focus on the management strategies to curb the inflation. This paper provides tangible yet descriptive reasons for this view and then illuminates on how this dilemma can suggestively be curbed as it will be apparent in the conclusion, and yet strongly believes that if implemented, these recommendations will undoubtedly erode these difficulties inclusively. It also takes hint of warning by the registrar of banks in an attempt to erode any malpractice by the bank against entrepreneurship thereby discouraging inflation escalations.

Key words: Entrepreneurialism, core banking industry, Inflation rate, managerial warning, South African Reserve Bank, strategic management.

INTRODUCTION

South Africa (SA) is claimed to be one of the well developed countries in the world with overwhelming supply of resources. Despite the fact that it is also financially well resourced, there are disturbing reports on the dilemma its central bank, South African Reserve Bank (SARB), is said to face regarding the inflation rising. This paper explores into and describes those possible causes of this predicament against entrepreneurship and argues that the SARB appears to fail to optimally apply and focus on the management strategies to curb the inflation. As indicated, this paper provides tangible yet descriptive reasons for this view and then illuminates on how this dilemma can suggestively be curbed. For this paper to achieve this purpose, it explores what the experts had to say, looks into organized scholastic literature and, most importantly, took hint of what the registrar of banks come up with, as it will be apparent in the conclusion.

This article vehemently believes that if implemented, these recommendations will undoubtedly erode these difficulties inclusively. This will be self-evident when it takes hint of warning by the registrar of banks in an attempt to erode any malpractice by the SARB against entrepreneurship thereby discouraging inflation escalations. Before illuminating on the articulations, it would serve no purpose without clarifying on some concepts underpinning contextualization into thesis of this paper in order to help wider audience arrive at its intended meaning. Overarching in the thematic evolution are the following underpinning concepts that go to the heart of this paper, namely entrepreneurialism; core banking industry; inflation rate; managerial warning and strategic management.

Entrepreneurialism: In this paper entrepreneurialism is a conglomerate term that encapsulates every aspect of management in connection with business and entrepreneurship.

Core banking industry: Core banking Industry includes all such banks within the borders of SA operating in the economic jurisdiction of SARB of which the latter is the
control body. Thus, this subsidiary body of banks [core banking industry] operates under the auspices of the SARB.

**Inflation rate:** Inflation rate should be understood as that percentage in access of the normal pricing of goods and services having a tendency of fluctuation from time to time thereby leaving the standards of life of grassroots [people on the ground] economically unpredictable and thus financially stranded and pertepped.

**Managerial warning:** This term denotes a strong warning by the registrar of banks in an attempt to erode any malpractice by the bank or banks in favour of entrepreneurship discouraging inflation escalations.

**Strategic management:** This is the innovative strategies embarked upon to ‘purify’ and promote efficiency of the banking industry.

This introductory area aimed to help ameliorate any possible and potential hurdle that might arouse obscurity against insightful understanding of thematic contextualization of the paper. However, if any inadequacy, this paper as it is a descriptive exploration, would have been clarified in the ultimate. The following area now concerns itself with what the experts had to say, looks into organized scholastic literature and, also takes hint of what the registrar of banks say, thus, styled underpinning conceptualization.

**UNDERPINNING CONCEPTUALIZATION**

The introductory area set out the mission of this paper according to the thematic approach coughed in the abstract. It further provided some definitions of some concepts underpinning the conceptual overall meaning of the purpose. This area concerns itself with what the experts had to say, looks into organized scholastic literature and then also takes hint of what the registrar of banks say, as indicated. Moreover, the articulations will also be strengthened by the contemporary insights from the Web sites in this regard.

**Expert opinion and organized scholastic literature**

As already stated, here is what the economic experts have to say. The SARB could increasingly find itself between a rock and a hard place with inflation rising and economic growth sluggish. Statistics South Africa (SA) announced recently that inflation as measured by the consumer price index (CPI) was above expectations at 4.1% year on year in March, up from 3.7% in February. It was the first time in eight months that consumer price index (CPI) inflation rose above 4%. On the same day, Statistics SA released the latest retail sales data which show retail sales growing below expectations compared to previous months. In other words, strategic management is not so much up to scratch for entrepreneurs (Rose, 2002). Christie Viljoen, an economist at NKC Independent Economists, said the retail sales figures showed that entrepreneurs were still cautious. The fact that SA’s economic recovery still appears to be lackluster while inflation is rising makes the SARB’s decision about what to do with interest rates even tougher,’ he said.

Economists have been speculating about the timing of the first interest rate hike as the effect of rising international oil food prices are expected to filter through to local CPI inflation (Pereira and Chiarini, 2010; Pereira et al., 2010). Some economists put the first rate hike as soon as meeting of the monetary policy committee while others say it will only happen in the next year ahead. The SARB warns in its financial stability review that a return to a lower inflation rate environment presents no threat to the recovery of credit extension to entrepreneurship.

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**Strategic management as core banking industry performance**

The scenario discussed earlier indicates the lack of strategic management on inflation rate on the part of the SARB as the central bank in South Africa (Hempel and Simonson, 1999). This has also been confirmed by a variety of economists as was apparent earlier. This area now discusses what the other banks do, as part of their strategic management, to curb this conundrum against
entrepreneurship (Mapsofworld, 2007). Core banking industry surveyed include, amongst others, Standard Bank, Capitech Bank, FNB, ABSA and Nedbank.

The Standard Bank and other banks’ strategies

As an indication of its strategic implementation, Standard Bank has become more ‘aggressive’ in its drive to increase the market share and fight off its peers in entry-level market space in its quest to curb inflation (Chu and Lim, 1998; Thamron, 2009). The group has formed a low-cost third-party distribution channel comprising 8 000 retail agents – from so-called spaza shops to butchers in the townships across the country (Tarawneh, 2006). A ‘spaza shop’ is a small rather than a medium-sized affordable business by people on the grassroots. This may be argued to be cheaper than setting up a branch from scratch. So next time a person goes to a spaza shop they can do their banking, and purchase milk, bread and airtime, for instance. Further, it is learnt that the bank plans to increase its footprint by partnering with at least 10 000 spaza shop owners by the end of 2011. SA’s big four banks are trying to protect and increase their presence in the low-cost banking sector since the rise of Capitech Bank, which is attracting about 70 000 new customers in just a month (Ho, 2001; Keller and Donald, 2001; Gup et al., 2007).

The reasoning here is that SA is said to have about 15 million unbanked and under-banked people and entrepreneurs and more than 12 million have never been banked. According to statistics, nearly 58% of workers receive their wages or salaries in cash – these are the people and entrepreneurs that these banks are fighting for. First National Bank (FNB) is poised to open 100 branches of EasyPlan, its low-cost bank, sometimes in mid-2011 and the network should have possibly increased to 150 by the end of 2011 (First National Bank, 2011). Amalgamated Banks of South Africa (ABSA) is said to have rolled out about 56 branches of its version of low-cost banking, called 1234, which offers transaction, savings, loans and life assurance accounts. Nedbank, on the other hand, is said to restructure its retail banking unit, which economic analysts say will take ‘a while to get it right’ (Zivković et al., 2008). Standard Bank’s low-cost branches, or bank shops, have introduced a transactional account called Mobile Banking, which enables entrepreneurs and other clients to use real-time retailer networks as well as cell-phone banking. Leon Barnard, Standard Bank’s head of inclusive banking indicated that the bank was not reacting to Capitec and African Bank. Rather, it was its (Standard Bank’s) partnership with cell-phone giants MTN that made the bank realize it could get into the low end of the market cost effectively. As another strategy, Standard Bank is reported to have subsequently bought the MTN Banking business from MTN Mobile Money SA (Gradzol et al., 2005). This adds to strategic management on inflation rate currently affecting entrepreneurship on the part of other banks other than SARB.

From what has been indicated before, it appears cheaper to open an account at a Bank Shop than in a branch (Stevanović, 2009), and this in itself beats the inflation rate currently affecting entrepreneurship. Additionally, entrepreneurs and other clients can open an account at no cost within 10 min and can purchase goods from these Bank Shops via their cell-phones in less than a minute. The Standard Bank Group reportedly has about 300 000 clients at Bank Shops and recruiting 40 000 more a month. To secure the entrepreneurs, all the risks of transporting cash are and will continue to be handled by the shop owner, who at present, has already been taken through vigorous screening process before a Standard Bank certified Banker to ensure entrepreneurial security (Fraser et al., 2001). Thus, the bank can grow its entrepreneurs and other customers while keeping additional costs to a minimum. The maximum that entrepreneurs and other clients can withdraw from a Bank Shop is R5 000 daily and R25 000 monthly with no fee charges (Standard Bank, 2011).

ABSA and Barclays Banks’ strategy

Financial services group ABSA and its parent company, Barclays, are reported to have agreed to implement a new Africa strategy, based in Johannesburg, SA (Leffifi, 2011). As a long-term strategy (Gradzol et al., 2005), Leffifi further indicated that from mid-2011, the head offices of ABSA Africa and Barclays Africa will be operationally combined and a new regional office will be established in Johannesburg, SA, to deliver the ‘One Bank in Africa’ strategy (Gradzol et al., 2005; Sherman and Rupert, 2006). Matthews Warren, a banking analyst with First Avenue Investment Management, believes this will remove the ‘conflicts’ that the financial groups might have when it comes to operating on the continent (Cronje, 2007). This will also at the same time remove the ‘Flaccid’ that the SARB has by being surpassed in delivering and supporting banking performance excellence to entrepreneurs (Manandhar and Tang, 2002; Wu et al., 2006). It is said that ABSA also envisaged that the geographical and global product structure will provide a platform that will enable them to look for opportunities to serve entrepreneurs and other customers better. But it can be seen that this recent announcement may be a precursor to Barclays increasing its stake to ABSA, especially if they are going to drive their Africa strategy from SA (Gradzol et al., 2005), they definitely would need more management influence in the entire business. That would imply that the shareholding might also change in the future thereby alleviating inflation rate (Chu and Lim, 1998; Thamron, 2009).
However, Errol Kruger, the Registrar of Banks indicated that Barclays had not indicated any intention to increase its stake in ABSA from its current 56%. This paper will now show this assurance indicating what then transpired. On this note, Comfort Duma, the assistant general secretary in charge of the ABSA portfolio at Sasho, a finance union representing about 20 000 ABSA staff members, cleared up this ‘misunderstanding’ ensuring that strategic management on the threat of inflation rate currently affecting entrepreneurship will be kept under control. This announcement came less than a week after FirstRand’s confirmation that it was conducting a due diligence exercise on Nigeria’s Sterling Bank. On the assurance, FirstRand was forced to notify the market after Sterling Bank’s Chief Financial Officer (CFO), Adebimpe Olambiwonnu, told ‘Consumer News and Business Channel’ (CNBC) Africa during an interview on its financial results that discussions with FirstRand were ongoing and ‘quite positive’. FirstRand, which has representative offices in Nigeria, has stated that it would like to enter the Nigerian market through a strategic partnership. It is also reportedly believed that it is considering spending up to $400-million to fund the investment. Sizwe Nxasana, FirstRand’s Chief Executive Officer (CEO), told shareholders at the last annual meeting that the company was also targeting ‘above average domestic growth markets’ other than only entrepreneurs, and countries that were ‘strongly positioned to benefit from trade and investment flows Africa and Asia, particularly China and India’ (Chu and Lim, 1998; Mukherjee et al., 2002; Thamron, 2009). This observation indicates that strategic management by banks other than the central bank on inflation rate currently affecting entrepreneurship will soon be under control (ABSA Bank, 2011); while at the same time central bank remains surpassingly flaccid (Howland and Rowse, 2006).

Strong warning from the registrar of banks

What follow are just a few lines of strong warning from the registrar of banks and worth mentioning (Gawlik, 2010). SA’s registrar of banks, Errol Kruger admitted that he allows himself a wry smile when local bank executives congratulated themselves on avoiding the worst of the fallout from the global recession. Despite projecting themselves as models of restraint and responsibility by the central bank, the fact is that if they would have had their way they would have had flaccid that got their international counterparts in this trouble of poor banking performance (Rahman et al., 2004). There was once a warning by the registrar of banks, Kruger that he was ‘worried about the way things were careering down the road at a scary rate of knots’. He indicated that people (entrepreneurs and clients) who did not want credit were being given credit. People who did not know they needed credit were waking up in the morning and finding cheques in the letter boxes - phone this number, bank this cheque and you have got the R20 000 (Pinyo, 2008). To remedy this kind of situation, Kruger met urgently with bank CEO’s and their boards and these were what he literally had to say:

‘If you take 12 o’clock as when things blow up, we were at ten to, unless you close the taps and start toeing the line (The Guardian, 2008).’

He warned that they must not be surprised when he started turning down their applications to the things they needed his approval for in terms of the Banks Act. He indicated that by so doing, he curbed a lot of excesses that would have been in place when the sub-prime crises exploded and tore banks around the world apart which would have been on their balance sheets (Avkiran, 1999; Christian et al., 2008). They are experiencing bad-debt problems now, making inflation rate so uncontrollably out of hand, are a picnic compared with what they might have been, as their banks would have had contaminated balance sheets (Muliaman et al., 2008).

Kruger also warned that anybody who thinks that the SA’s banking wizards were ethically or intellectually above dabbling in the man-oeuvres that landed taxpayers overseas with such crippling bills should think again (Copelovitch and Singer, 2009). He indicated that they (the banks) should think again as they could have ended up with a lot of activity in some of those areas where those highly toxic assets were being traded (Mostafa, 2007).

He also disagreed with the common perception that the banks’ exchange controls would not allowed that state of affairs (Francis and Iyare, 2010). A number of their banks could have been participating in those markets because they have operations offshore and take deposits in those markets and can deploy them however they deemed fit (Ho and Zhu, 2004). They also most certainly could have got involved in the same toxic assets that lured their international counterparts at the expense of the local entrepreneurs (Ivanović and Bojović, 2010). That is the point and fact that they did not have a lot to do with Kruger and his bank supervision team at the Reserve Bank in Pretoria (Gilbert and Wheelock, 2007).

This was the risk management parameters, in large part guided by regulation from the home base that saved them (Murthy et al., 2008). Kruger indicated that they did not sit back as a home country regulator and not participate actively in the supervision of their banks that were hosted in other countries (Maudos et al., 2002; Beccalli et al., 2006). He indicated that they had good relationships with other regulators in those jurisdictions yet SA banks still needed their approval for many of the things they wanted to do in those countries (Crone, 2010). The following discussion provides analyses of the paper holistically.
ANALYSES

In this area the paper analyses and then briefly discusses only those main points of articulations already reviewed. In order to fall squarely within the scope of this paper’s thematic exposition, this discussion focuses on the analyses of business and entrepreneurial management; core banking industry and corporate strategy; inflation rate and managerial warning as already defined (cf introductory), and reviewed. In this way it is hoped that the ipse dixit [or the crux] of the thematic exposition shall have significantly been arrived at.

Business and entrepreneurial management

Business and entrepreneurship according to ordinary course of events will never be able to contribute to achieve better living standards, let alone to assist to gross domestic product (GDP) unless they are assisted by the banking industry around which they exist. This phenomenon in business circles is referred to as corporate social responsibility (CSR). For business and entrepreneurship in SA to manage their financial affairs perhaps even adequately, CSR would then play a cardinal role. In the articulations it saw how these banks indeed accomplish this goal. For example, Standard Bank plans to increase its footprint by partnering with at least 10 000 spaza shop owners by the end of 2011. This should be seen to be a milestone achievement.

Core banking industry and corporate strategy

It has already been indicated that core banking industry includes all such banks within the borders of SA operating in the economic jurisdiction of SARB of which the latter is the control body. Thus, this subsidiary body of banks [core banking industry] operates under the auspices of the SARB. These banks include Standard Bank, Capitech Bank, FNB, ABSA and Nedbank. During the survey, it was, in addition to the afore-mentioned, that these banks are up in arms to financially assist businesses, especially small businesses to avoid a situation where the owners live between hand and mouth. It was also evident that First National Bank (FNB) is poised to open 100 branches of EasyPlan, its low-cost bank, sometimes in mid-2011 and the network should have possibly increased to 150 by the end of 2011. ABSA is said to have rolled out about 56 branches of its version of low-cost banking already, called 1234, which offers transaction, savings, loans and life assurance accounts very affordably to its clients.

Nedbank, on the other hand, although it was indicated that it will take ‘a while to get it right’, is said to restructure its retail banking unit. Standard Bank’s low-cost branches, or bank shops, have introduced a transactional account called mobile banking, which enables entrepreneurs and other clients to use real-time retailer networks as well as cell-phone banking. Leon Barnard, Standard Bank’s head of inclusive banking indicated that the bank was not reacting to Capitec and African Bank. Capitech Bank’s strategy to open their doors even on Sundays for its clients for instance, is such a plausible corporate strategy. Additionally, it was Standard Bank’s partnership with cell-phone giants MTN that made the bank realize it could get into the low end of the market cost effectively. As another strategy, it was seen that Standard Bank is reported to have subsequently bought the MTN Banking business from MTN Mobile Money SA. Additionally, entrepreneurs and other clients can open an account at no cost within 10 min and can purchase goods from these Bank Shops via their cell-phones in less than a minute. The Standard Bank Group reportedly has about 300 000 clients at bank shops and recruiting 40 000 more a month. To secure the entrepreneurs, all the risks of transporting cash are and will continue to be handled by the shop owner, who at present, has already been taken through vigorous screening process before a Standard Bank certified banker to ensure entrepreneurial security (Fraser et al., 2001). Thus, the bank can grow its entrepreneurs and other customers while keeping additional costs to a minimum. The maximum that entrepreneurs and other clients can withdraw from a Bank Shop is £5 000 daily and £25 000 monthly with no fee charges.

Regarding ABSA, its financial services group and its parent company, Barclays, are reported to have agreed to implement a new Africa strategy, based in Johannesburg. As a long-term strategy (Gradzol et al., 2005), Lefifi further indicated that from mid-2011, the head offices of ABSA Africa and Barclays Africa will be operationally combined and a new regional office will be established in Johannesburg, SA, to deliver the ‘One Bank in Africa’ strategy. All these innovative strategies embarked upon are obviously not only meant to ‘purify’ and promote efficiency within the banking industry, but to also curb the inflation rate.

Inflation rate

Inflation rate as was understood as that percentage in access of the normal pricing of goods and services having a tendency of fluctuation from time to time thereby leaving the standards of life of grassroots [people on the ground] economically unpredictable and thus financially stranded and perturbed, is a world-class conundrum. One would for example take a look at the petrol price hikes in SA and even elsewhere. With this in mind, the registrar of banks saw it expedient to give a signal to the entire banking industry in SA to be mindful about due care to customers and the promotion of entrepreneurship generally, hence his strong-worded warning. It would also
be plausible how the banking industry in SA is painstaking to develop entrepreneurship. Arguably, the span of inflation growth can be cut shamefully short if our banking industry, like anywhere else internationally, can continue to operate as do. Thumps up Mzansi banks, thumps up!

Managerial warning

Term denotes a strong warning by the registrar of banks in an attempt to erode any malpractice by the bank or banks in favour of entrepreneurship discouraging inflation escalations. Here, the strong warning coughed by the registrar of banks is indicative of the manner in which the SARB as opposed to other subsidiary banks operates. Subsidiary banks, also surveyed, include, amongst others, Standard Bank, Capitech Bank, FNB, ABSA and Nedbank. The warning expounds essentially and gives a signal that unless the SARB begins to do what other banks are doing internationally, SA will end up submerged in incurable debts ending up in economic recession like that of 2008. In this regard, one would be tempted to mention that had it not been because of the so-called ‘2010 FIFA World Cup’, SA would have been in financial crises. Just in the absence of this, one would just imagine where SA would be had it not been because of the 2010 FIFA World cup. Besides this, other banks already surveyed, are actually trying their level most excellent to uplift small businesses and entrepreneurship.

Internationally, global entrepreneurship monitor (GEM) prides itself on its reputation for generating applied research of the highest standard. Central to its mission is the determination to deliver impact; GEM is committed to generating entrepreneurial research that makes a sustainable difference to people, organizations and economies. Its researchers work with businesses to develop tools and interventions that deliver tangible commercial benefits and make a lasting contribution to its success. Aston is the second largest provider of knowledge transfer partnerships (KTPs) in the West Midlands, and twelfth largest in the UK. Available online at http://www1.aston.ac.uk/aston-business-school/research/impact/. [Retrieved May 22, 2012].

Practical thought and comment

In the overall, Errol Kruger, contended that competition is good, but sustainability is the name of the game. He further thought that the biggest challenge contributing to inflation is not only the SARB but also all other SA banks is the interest rates. Appropriate interest rates helped SA save the worst of the recession although left a lot of bad debt which is not coming down. Although the growth in bad debt has slowed down, this paper indicated how other SA banks removed dents in the hard core bad debts on entrepreneurial service improvement. Total bad debt removal as a remnant of a recent international recession leaves this research futuristic and more attention needs to be focused on this aspect. If this is done, perspective on the core banking industry performance surpassing flaccid SARB on strategic management upon inflation rate currently affecting entrepreneurship, will take a different turn in banking fraternity and thus, the development of entrepreneurship in SA.

METHODOLOGY

This paper followed both qualitative and a bid of quantitative paradigms. It was qualitative in that it described some economic phenomena within the banking industry where economic expertise was rigorously considered to illuminate the economic conundrum of inflation rate hiking. It was slightly quantitative as it considered economic indices in its numeric insightful calculation of consumer price indexing. This paper essentially concerned itself with what the experts had to say, looked into organized scholastic literature and then also took hint of what the registrar of banks say. The articulations were also given strength by few contemporary insights from the Web sites.

This descriptive paper also rigorously described how the banks, other than the SARB as the central bank, treat entrepreneurs and other clients (Cooper and Schindler, 2008). It further took a look at what these banks do about the SARB’s reported quandary over the inflation rise and compared this with what the international position is. It also discussed the management strategies capable to curb the inflation rise. This paper further provided tangible and descriptive reasoning for this view spearheaded by other banks and then illuminated the ways on how this dilemma can suggestively be curbed. It also fully described and took hint of strong warning by the registrar of banks in an attempt to erode any malpractice by the bank against entrepreneurship thereby discouraging unnecessary inflation escalations (Rose and Hudgins, 2005). This paper finally provided a recommendation which it strongly believed that, if implemented, will undoubtedly help erode these difficulties inclusive of the surpassing flaccid of the SARB (South African Reserve Bank, 2011).

MANAGERIAL IMPLICATIONS AND FINDINGS

There is a vast indication that the banking industry other than the SARB, as reviewed, showed an increase in a concern about the inflation in SA. This paper looked into and described those concerns [possible causes of this predicament against entrepreneurship] and from that came up with the following:

1) Business and entrepreneurship will never be able to contribute to achieve better living standards, moreover contribution to GDP will not be possible unless they are assisted by the banking industry around which they exists.
2) Innovative strategies embarked upon by other banks other than SARB are not only meant to ‘purify’, promote efficiency and develop entrepreneurship within the banking industry, but to also curb the inflation rate.
3) As inflation rate has a tendency of fluctuation from time
to time thereby leaving the standards of life of people on the ground economically and thus financially stranded, is a world-class conundrum and can be eroded by the SARB [as the central bank in SA] and other banks developing entrepreneurship.

4) The warning by the registrar of banks in an attempt to erode any malpractice by the bank against entrepreneurship thereby discouraging inflation escalations should be considered.

5) The paper strongly believes that if these recommendations can be implemented will undoubtedly erode these difficulties inclusively.

Regarding the SARB the following were found:

The SARB appears to have failed to optimally apply and focus on the management strategies to curb the inflation, hence the strong-worded warning by the registrar of banks. But finally, to avoid other banks to put the SARB into shame pertaining to entrepreneurial development, the SARB should follow suit as what the other banks are doing and avoid existing in vacuum.

Conclusion

This paper described how the banks, other than the SARB as the central bank in SA, treat entrepreneurs and other clients (Cooper and Schindler, 2008). It further took a look at what these banks do about the SARB’s reported quandary over the inflation rise. This it did by discussing the management strategies capable to curb the inflation rise. This paper further provided tangible and descriptive reasons for this view spearheaded by other banks and then illuminated the ways on how this dilemma can suggestively be curbed. It also fully described and took hint of strong warning by the registrar of the SA banks, Errol Kruger, in an attempt to erode any malpractice by the SARB against entrepreneurship thereby discouraging unnecessary inflation escalations (Rose and Hudgins, 2005). Finally, it is recommended that SARB should start to look at the inflation seriously by providing the necessary support and amenities to commercial banks so as to make them inculcate the spirit of competitive advantage within the international banking fraternity. This paper strongly believes that, if these recommendations are implemented, will undoubtedly help erode these difficulties inclusive of the surpassing flaccid of the SARB (South African Reserve Bank, 2011). Strategic management on inflation rate currently affecting SARB, crime currently experienced by SA and most specifically joblessness, will to a very large extent reduce.

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Full Length Research Paper

A comparison of financial performance of commercial banks: A case study of Nepal

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The objective of this study was to compare the financial performance of different ownership structured commercial banks in Nepal based on their financial characteristics and identify the determinants of performance exposed by the financial ratios, which were based on CAMEL Model. Eighteen commercial banks for the period 2005 to 2010 were financially analyzed. In addition, econometric model (multivariate regression analysis) by formulating two regression models was used to estimate the impact of capital adequacy ratio, non-performing loan ratio, interest expenses to total loan, net interest margin ratio and credit to deposit ratio on the financial profitability namely return on assets and return on equity of these banks. The results show that public sector banks are significantly less efficient than their counterpart are; however domestic private banks are equally efficient to foreign-owned (joint-venture) banks. Furthermore, the estimation results reveal that return on assets was significantly influenced by capital adequacy ratio, interest expenses to total loan and net interest margin, while capital adequacy ratio had considerable effect on return on equity.

Key words: Financial performance, commercial banks, financial ratios analysis, Nepal.

INTRODUCTION

Financial sector is the backbone of economy of a country. It works as a facilitator for achieving sustained economic growth through providing efficient monetary intermediation. A strong financial system promotes investment by financing productive business opportunities, mobilizing savings, efficiently allocating resources and makes easy the trade of goods and services. Several studies (McKinnon, 1973; Levine, 1997) have reported that the efficacy of a financial system to reduce information and transaction costs plays an important role in determining the rate of savings, investment decisions, technological innovations and hence the rate of economic growth.

Banking has become an important feature, which renders service to the people in financial matters, and its magnitude of action is extending day by day. It is a major financial institutional system in Nepal, which accounted for more than 70% (Poudel, 2005) of the total assets of all the financial institutions. A profitable and sound banking sector is at a better point to endure adverse upsets and adds performance in the financial system (Athanasoglou et al., 2008).

A competitive banking system promotes the efficiency and therefore important for growth, but market power is necessary for stability in the banking system (Northcott, 2004). Commercial bank holds a large share of economic activities of a country. The function of the commercial banks has been enhanced in Nepal to sustain the increasing need of the service sector and the economy in general (Economic Survey, 2008).

Stock market has been dominated by the commercial banks since a decade. Not only the stock market, but the commercial banks have also been major contributors to the revenue of the country. They have been paying a large amount of tax every year.

Performance evaluation is the important approach for enterprises to give incentive and restraint to their operators and it is an important channel for enterprise stakeholders to get the performance information (Sun, 2011). The performance evaluation of a commercial bank is usually related to how well the bank can use its assets, shareholders’ equities and liabilities, revenues and

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Financial ratio analysis is also used to quantitatively examine the differences in performance among public sector banks (PVB), joint venture banks (JVB) and domestic private banks (DPB) in Nepal, and the banks are ranked based on their financial measures and performance for each bank as a guideline for the future trend of financial position of the banks in Nepal. Therefore, the aim of this study is to measure the best performance among the commercial banks and to find out the relationship between bank specific factors (Ratios) on the banks' performance. Based on the objectives, the present study seeks to test the following hypothesis:

\[ H_1: \text{There is a significant relationship between capital adequacy ratios and performance of the banks.} \]

\[ H_2: \text{There is a significant relationship between asset quality ratios and performance of the banks.} \]

\[ H_3: \text{There is a significant relationship between management efficiency ratios and performance of the banks.} \]

\[ H_4: \text{There is a significant relationship between earning ratios and performance of the banks.} \]

\[ H_5: \text{There is a significant relationship between liquidity ratios and performance of the banks.} \]

The factors considered for analysis include ROA and ROE (profitability ratio) as dependent variables, which each examines separately with same explanatory variables that is, CAR, NPL, IETTL, NIM, CDR.

The remainder of the paper is organized as follows: subsequently, the study presents the literature review. Next, it describes the banking sector in Nepal. Thereafter, it presents the methodology of the study followed by details of the results and analysis of the available data and finally, the study was concluded.

**LITERATURE REVIEW**

The trend of commercial banking is changing rapidly. Competition is getting stiffer and, therefore, banks need to enhance their competitiveness and efficiency by improving performance. Normally, the financial performance of commercial banks and other financial institutions has been measured using a combination of financial ratios analysis, benchmarking, measuring performance against budget or a mix of these methodologies (Avkiran, 1995).

Gopinathan (2009) has presented that the financial ratios analysis can spot better investment options for investors as the ratio analysis measures various aspects of the performance and analyzes fundamentals of a company or an institution. Furthermore, Ho and Zhu (2004) have reported that the evaluation of a company’s performance has been focusing the operational effectiveness and efficiency, which might influence the company’s survival directly. The empirical results of the researches (Raza et al., 2011; Tarawneh, 2006) explained that a company, which has better efficiency, it does not mean that always it will show the better effectiveness. Alam et al. (2011) study concludes that ranking of banks differ as the financial ratio changes.

Bakar and Tahir (2009) in their paper used multiple linear regression technique and simulated neural network techniques for predicting bank performance. ROA was used as dependent variable of bank performance and seven variables including liquidity, credit risk, cost to income ratio, size and concentration ratio, were used as independent variables.

They concluded that neural network method outperforms the multiple linear regression method however it need clarification on the factor used and they noted that multiple linear regressions, not withstanding its limitations, can be used as a simple tool to study the linear relationship between the dependent variable and independent variables.

Neceur (2003) using a sample of ten Tunisian banks from 1980 to 2000 and a panel linear regression model, reported a strong positive impact of capitalization to ROA. There are number of studies, which examine the bank performance using CAMEL framework, which is the latest model of financial analysis.

Elyor (2009) and Uzhegova (2010) have used CAMEL model to examine factors affecting bank profitability with success. The CAMEL Framework is the most widely used model (Baral, 2005). The Central bank of Nepal (NRB) has also implemented CAMEL Framework for performance evaluation of the banks and other financial institutions.

CAMEL stands for capital adequacy, asset quality,
management efficiency, earnings performance and liquidity. The capital adequacy ratio is a key measure to determine the health of banks and financial institutions. Capital adequacy refers to the sufficiency of the amount of equity to absorb any shocks that the bank may experience (Kosmidou, 2008).

Nepalese commercial banks need to maintain at least 6% Tier-1 capital and 10% total capital (Tier 1 and Tier 2), that is, core capital and supplementary capital respectively. Tier 1 capital consists of paid-up capital, share premium, non-redeemable preference share, general reserve fund, accumulated profit, capital redemption reserve, capital adjustment fund, and other free reserves. The Tier 2 capital comprises of capital comprises of general loan loss provision, assets revaluation reserve, hybrid capital instruments, subordinated term loan, exchange equalization reserve, excess loan loss provision, and investment adjustment reserve.

These minimum capital adequacy requirements are based on the risk-weighted exposures of the banks (NRB, 2010). Credit risk is one of the factors that affect the health of an individual bank while asset quality analysis involves taking account of the likelihood of borrowers paying back loans. The extent of the credit risk depends on the quality of assets held by an individual bank.

The quality of assets held by a bank depends on exposure to specific risks, trends in non-performing loans, and the health and profitability of bank borrowers (Baral, 2005). Poor asset quality and low levels of liquidity are the two major causes of bank failures. Poor asset quality led to many bank failures in Kenya in the early 1980s (Olweny and Shipo, 2011).

NRB uses composition of assets, non-performing loan to total loan ratio, net non-performing loan to total loan ratio as the indicators of the quality of assets of the commercial banks (NRB, 2010). The maximum NPL allows for a healthy bank is 5%. Management quality plays a big role in determining the future of the bank. The management has an overview of a bank's operations, manages the quality of loans and has to ensure that the bank is profitable.

Rahman et al. (2004) and Elyor (2009) noted that interest expenses divided to total loans can be measured as the bank management quality. Ability to support the present and future operations of a bank depends on the quality of its earnings and profitability profile (Share et al., 2011). NRB uses return on total assets as an indicator of profitability of a commercial bank.

In addition, it uses the absolute measures such as interest income, net interest income, non-interest income, net non-interest income, non-operating income, net non-operating income and net profit, to evaluate the profitability of a commercial bank (NRB, 2010). Liquidity management is one of the most important functions of a bank. If funds tapped are not properly utilized, the institution will suffer loss (Sangmi and Nazir, 2010).

THE COMMERCIAL BANKS IN NEPAL

Financial development in many developing economies like Nepal is still faced by a number of obstacles such as macroeconomic instability, the fragility of stock markets, the limitation of capital markets, and the inefficiency of development and specialized banks. Despite some of these limitations, banking systems in underdeveloped countries remain integral components of the general economic systems and they can be considered as a key element in any development effort (Zeinab, 2006).

The commercial banks are currently regarded as key driver of financial institutions of Nepal. Financial services sector had commenced with the establishment of Nepal Bank Limited in 1937 (Baral, 2005). After the liberalization in the mid-1980s, the government permitted the opening of commercial banks in joint venture with foreign banks. Since then, the Nepalese financial system has undergone rapid structural changes, with a large number of financial institutions expose and display of financial products and services.

There are presently 263 financial institutions among them 27 are commercial banks (NRB, 2010). The market size of both the joint venture and domestic private banks has been increasing at the expense of the public sector banks, which are shrinking over time. The commercial banks are divided into three separate groups based on ownership namely, (i) public sector banks, (ii) joint venture banks, and (iii) domestic private banks.

Public sector banks

Public sector banks have substantial shares in the total assets of the industry and have huge branch networks around the country. Rastriya Baniya Bank (RBB), Nepal Bank Limited (NBL) and Agriculture Development Bank (ADB) are government owned banks. These banks have significant contribution on improving banking habit among the people at large and encourage entrepreneurship in both the urban as well as rural area. The public sector banks are still the largest banks in all aspects from deposit and credit mobilization to the number of branches in operation.

Joint venture banks

The joint venture banks have very few branch networks and are concentrated in urban centers. JVBs started to establish since mid-1980s (Poudel, 2005) and there are seven in Nepal (NRB, 2010) including; Nabil Bank Ltd (NABIL), Standard Charter Bank Ltd (SCBL), Himalayan
Bank Ltd (HBL), Nepal SBI Bank Ltd (NSBI), Nepal Bangladesh Bank Ltd (NBBL) and Everest Bank Ltd (EBL). They have foreign equity participation (along with domestic) and management with good name with international reputation, conducting banking business professionally. They are well mechanized and supervised by their respective home country supervisory authorities. The share of total assets of the joint venture banks has increased to about 50% of total commercial bank assets. The introduction of joint venture banks infused modern banking and financial technology and new financial instrument in the financial system. However, the spillover effect of their efficient management and modern banking skills was less in the domestic banks, as per expectation.

Domestic private banks

Domestic private banks came in operation by late 1990s and early 2000s. There are seventeen domestic private banks including; Nepal Investment Bank Ltd (NIBL), Bank of Kathmandu Ltd (BOK), Nepal Credit and Commerce Bank Ltd (NCCBL), Lumbini Bank Ltd (LBL), Nepal Industrial and Commercial Bank Ltd (NIC), Machhapuchhre Bank Ltd (MPBL), Kumari Bank Ltd (KBL), Laxmi Bank Ltd (LXBL) and Siddhartha Bank Ltd (SBL).

They are managed and owned by private sector without foreign equity participation. Since they are relatively new banks, they have the opportunity to start as ‘fresh banks’ without bad loans in their portfolios and with the possibility of adopting recent banking technologies during their inception. Most of them are relatively small in asset size as well as their networks.

METHODODOLOGY

The purpose of this study is to evaluate the factors determining the performance of the Nepalese commercial banks. The data are mainly obtained from the Nepal Rastra Bank Bulletin (published by the Central Bank of Nepal), annual audited financial statements of commercial banks (published by the respective banks), and yearly economic survey. Average of six years ratios from 2005 to 2010 was evaluated to assess the financial performance of the commercial banks in Nepal.

Eighteen commercial banks, which have been established before 2005 in Nepal, were selected for the analysis in this study. The financial ratios used to assess bank performance were taken based on the CAMEL Framework such as capital adequacy, asset quality, management, earnings and liquidity. All the ratios were used to test the hypothesis.

This study uses a descriptive financial analysis to describe, measure, compare, and classify the financial situations of Nepalese commercial banks and as well as applied an econometric multivariate regression model to test the significance of variables on performance of Nepalese commercial banks. The profitability ratios (ROA and ROE) are assumed as dependent variables while capital adequacy ratio (CAR), non-performing loan ratio (NPL), interest expenses to total loan (IETTL), net interest margin ratio (NIM) and credit to deposit ratio (CDR) are as independents variables.

Econometric models

This study examined the effects of bank specific variables on:

\[
\text{ROA} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon \ldots \quad (1)
\]

\[
\text{ROE} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon \ldots \quad (2)
\]

Where, \( X_1 \) - CAR (Tier 1 Capital + Tier 2 Capital / risk weighted assets), \( X_2 \) - NPL (non-performing loans/total loans), \( X_3 \) - IETTL – Interest expense / total loans, \( X_4 \) - NIM – Net interest margin, \( X_5 \) - CDR - Credit to deposit ratio.

In the previous equation, \( \beta_0 \) is constant and \( \beta \) is coefficient of variables while \( \epsilon \) is the residual error of the regression. All estimations have been performed in the SPSS software program whereas the ordinary calculations in Excel.

RESULTS AND DISCUSSION

Financial ratios of commercial banks in Nepal

Profitability

In this study, the position of profitability has been measured with the help of return on assets and return on equity. Return on assets (ROA) is a comprehensive measure of overall bank performance from an accounting perspective (Sinkey and Joseph, 1992). Table 1, column 1 depicts average ROA of major commercial banks in Nepal for the period 2005 to 2010.

The average ROAs of all the premeditated banks have been estimated positive demonstrates that in the recent years, the performance of the banking system in Nepal is reasonable in terms of net profit. The average ROA of PSB (2.37%) was found higher than that of JVB (1.77%) and DPB (1.33%) due to having utmost total assets. The earning performance of PSB was satisfactory and no public banks were suffered from net operating loss. Among the public sector banks, the average ROA of RBBL bank was determined 3.34% with positive trend during the study period. The net profit to total assets ratio of RBBL bank to gain profit seemed most attractive due to proper mobilization of available resources than other public banks has appeared better position. The second position was for ADBL bank with average ROA equaled to 1.94%.

Over the study period, there was a positive trend in ROA. The last position was belonged to NBL bank with average ROA equaled to 1.84% but ROA values computed during the study period were found positive. SCBL was maintained first place with ROA equaled to 2.51% among joint venture banks, while the second position was for NABIL bank (2.48%) and the last position was belonged to NSBI (1.13%).

The average ROA of BOK was noted 1.89% and this bank was ranked first position among the domestic private banks. The second position was for LBL bank with ROA equaled to 1.82% and the last position was belonged to NCCBL with ROA equaled to 0.43%. The
Table 1. Average ratio of the commercial banks measuring the banking performance.

<table>
<thead>
<tr>
<th>Bank</th>
<th>ROA</th>
<th>ROE</th>
<th>CAR</th>
<th>NPL</th>
<th>IETTL</th>
<th>NIM</th>
<th>CD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NBL</td>
<td>1.84</td>
<td>-12.89</td>
<td>-28.77</td>
<td>17.27</td>
<td>6.27</td>
<td>3.49</td>
<td>42.9</td>
</tr>
<tr>
<td>RBBL</td>
<td>3.34</td>
<td>-12.42</td>
<td>-38.75</td>
<td>27.21</td>
<td>5.37</td>
<td>3.41</td>
<td>51.27</td>
</tr>
<tr>
<td>ADBL</td>
<td>1.94</td>
<td>6.44</td>
<td>5.59</td>
<td>14.69</td>
<td>5.31</td>
<td>5.61</td>
<td>112.82</td>
</tr>
<tr>
<td>Average</td>
<td>2.37</td>
<td>-6.29</td>
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<td>19.72</td>
<td>16.95</td>
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<td>69.00</td>
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</tr>
<tr>
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<td>1.14</td>
<td>3.84</td>
<td>3.98</td>
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<td>14.86</td>
<td>4.17</td>
<td>4.33</td>
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</tr>
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<td>23.02</td>
<td>9.32</td>
<td>5.97</td>
<td>28.72</td>
<td>21.30</td>
<td>67.80</td>
</tr>
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<td>76.01</td>
</tr>
<tr>
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<td>5.47</td>
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<td>84.33</td>
</tr>
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<td>5.58</td>
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<td>5.15</td>
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<td>93.4</td>
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<tr>
<td>Average</td>
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<td>10.72</td>
<td>4.43</td>
<td>47.83</td>
<td>26.65</td>
<td>84.79</td>
</tr>
</tbody>
</table>

average ROAs of NCCBL (JVB), MPBL (DPB) and LXBL (DPB) were estimated less than 1 fall in the marginal earning performance (Baral, 2005). As ROAs of the most of the larger banks were estimated greater than those of the smaller banks, it can be concluded that the larger banks were successful in mobilizing their available resources more effectively. Furthermore, availability of limited number of assets restricts the proper utilization of resources and ultimately the earning profit.

The ROE of the major commercial banks in Nepal are presented for the average of the six years in Table 1, column 2. The situation of PSB was most awful with fluctuating and negative ROE trends. The average ROE ratio was -12.89% for NBL, -12.42% for RBBL and 6.44% for ADBL. This implies that the shareholders receive very low returns in terms of dividend.

The ROE of ADBL was only estimated in positive among the three public banks. It seems ADBL was efficiently utilizing its shareholders' funds. The average ROEs for the JVB were noted better than PSB and stood positive over the period 2005 to 2010. In order to rank the JVBs based on this ratio, SCBL was the first one; it has an average ROE of 33.83%.

The second position was for NABIL with ROE equaled to 31.87%, and the last position was belonged to NBBL with ROE equaled to 8.44%. It shows that JVB had satisfactory earning profit and the shareholders earn better return on their investment.

The average ROEs of all DPB were going positive except that of LBL. In order to rank the banks based on this ratio, NCCBL was the first one. It had an average ROE of 57.25%. The second position was for BOK with ROE equaled to 24.65%, and the last position was belonging with LBL with ROE equaled to -3.31%. It shows DPBs were efficiently use their shareholders’ funds and earning net profit in satisfactory level.

### Capital adequacy

As stated in the foregoing analysis, banks under study are well capitalized and they are complying with the directive of NRB on capital adequacy ratio. However, their capital base relative to the risk-weighted assets is not so strong.

According to the international rating convention, total capital should be greater than 19.5% of the total risk weighted assets of commercial banks in order to be a strong capital base. However, none of the banks under study had the capital fund greater than 19.5% of the total risk weighted capital. As indicated by CAR, on the average, capital adequacy of joint venture banks was fair...
during the study period. Total capital adequacy ratio less than 15 and equal to 12 indicates that capital adequacy is fair and on the average, this ratio falls within this range.

It is clear from Table 1 column 3 that the average capital adequacy ratio of two public banks NBL and RBBL were negative due to the heavy accumulated losses. Due to the inherent problems and big chunk of NPA, the public sector banks suffered from massive losses in the past, which had heavy impact on their capital adequacy. Although, the public banks had started to improve their financial condition, it is very different from an acceptable standard.

However, ADBL capital adequacy ratio was seemed to be positive but ADBL was also not achieved the NRB requirement. Most of the joint venture banks have accomplished the capital adequacy ratio as directed by NRB. The banks with non-compliance were NBBL (-5.58%). In addition, average capital fund ratio of joint venture banks during the study period hang around 14%. This was higher than the minimum ratio specified by NRB. This clearly implies that joint venture banks are complying with the directive of NRB on the requirement of the capital base of commercial banks.

All the selected domestic private banks had complied with the statutory capital adequacy ratio of 10%. The banks with non-compliance were LBL (5.4%) and NCCBL (4.52%). As transactions of the bank increases, the risk weighted assets also increases in the same manner.

However, this creates banks difficulty to maintain capital fund as required by the NRB as often capital do not increase and the performance of the bank (that is, earning of profit) has major role to play to comply with the NRB requirements. As such, it is evident that the domestic private bank has been performing well enough to comply with the NRB requirement without failure at any point of time except LBL. It means domestic bank has mobilized capital from the stock market; hence, the bank has been capable to sustain the assurance of shareholders and depositors.

**Asset quality**

It is obvious from the theoretical prescription that the performance of commercial banks largely depends on the quality of assets held by them, and quality of the assets relies on the financial health of their borrowers.

As stated earlier, many indicators can be used to measure the quality of assets held by commercial banks. Loans are one of the major outputs provided by a bank, but as loan is a risk output, there is always an ex ante risk for a loan to eventually become non-performing (Yike et al., 2011).

However, here, only one simple indicator – non-performing loan ratio was used to measure the quality of assets being held by the banks. The increasing trend of these ratios shows the deteriorating quality of commercial bank assets.

Table 1, column 4 depicts that in the period of 2005 to 2010, the average NPL ratio was 17.27% for NBL, 27.21% for RBBL and 14.69% for ADBL. The ratio of NPL in the public bank was very high when compared with the joint venture banks and domestic private banks. The share of public sector banks in NPL was extremely high accounting that simply indicates the degradation of quality of loans and concentration as well.

Among the JV banks, the average NPL ratio of NBBL and NCCBL were very high. These two banks were not satisfactory level. Other joint venture banks on the average were at reasonable level, but they are far below the aggregate percentage of non-performing assets of the commercial banks. NPL indicators show that joint venture banks were improving the quality of their assets year by year. Average NPL ratio of LBL was superior to other domestic private banks.

Other domestic private banks on the average were at reasonable level. However, the banks NPL ratio was below the aggregate percentage and was in decreasing trend. The declining ratio of NPL had reflected a better quality of their assets year by year.

**Management**

Table 1, column 5 exhibits average IETTL of major commercial banks in Nepal for the period 2005 to 2010. The average IETTL of PSB (16.95%) was found lower than that of JVB (28.72%) and DPB (47.83%) because management of the public sector banks was the least efficient among the sampled commercial banks. However, the joint venture and domestic private sector banks were managed the quality of loans and ensured profit.

ADBL (5.31%) management was the least efficient among the sampled public sector banks, whereas EBL (7.39%) management was the most efficient among the joint venture banks, and NCCBL (6.51%) was the efficient among the private sector banks.

**Earning**

The net interest margin (NIM) measures how large the spread between interest revenues and interest costs that management has been able to achieve by close control over earning assets and the pursuit of the cheapest sources of funding (Rose et al., 2006). NIM has been treated as an extremely important measure to the bank and its minimum value for a healthy bank is considered about 4%. A small change in the interest margin has a huge impact on profitability. Higher NIM is associated with profitable banks by maintaining good asset quality. The public sector banks in Nepal are entirely different from joint-venture banks and private
Table 2. Ranks of the commercial banks in Nepal.

<table>
<thead>
<tr>
<th>Bank</th>
<th>ROA</th>
<th>ROE</th>
<th>CAR</th>
<th>NPL</th>
<th>IETTL</th>
<th>NIM</th>
<th>CD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBL</td>
<td>6</td>
<td>18</td>
<td>17</td>
<td>16</td>
<td>4</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>RBB</td>
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<td>18</td>
<td>18</td>
<td>7</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>ADBL</td>
<td>4</td>
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<td>13</td>
<td>13</td>
<td>8</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>NABIL</td>
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<td>3</td>
<td>10</td>
<td>5</td>
<td>17</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>SCBL</td>
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<td>1</td>
<td>7</td>
<td>14</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>HBL</td>
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<td>12</td>
<td>18</td>
<td>5</td>
<td>15</td>
</tr>
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<td>NSBI</td>
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<td>9</td>
<td>5</td>
<td>11</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>NBB</td>
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<td>14</td>
<td>16</td>
<td>17</td>
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<td>12</td>
<td>6</td>
</tr>
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<td>EBL</td>
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<td>9</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>NIBL</td>
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<td>6</td>
<td>11</td>
<td>9</td>
<td>15</td>
<td>11</td>
<td>11</td>
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<td>6</td>
<td>10</td>
<td>16</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>NCCBL</td>
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<td>15</td>
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<td>2</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>LBL</td>
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<td>14</td>
<td>15</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>NIC</td>
<td>10</td>
<td>8</td>
<td>3</td>
<td>8</td>
<td>6</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>MPBL</td>
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<td>7</td>
<td>6</td>
<td>5</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>KBL</td>
<td>14</td>
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<td>4</td>
<td>2</td>
<td>9</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>LXBL</td>
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<td>2</td>
<td>1</td>
<td>11</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>SBL</td>
<td>12</td>
<td>11</td>
<td>8</td>
<td>4</td>
<td>10</td>
<td>18</td>
<td>2</td>
</tr>
</tbody>
</table>

banks. Table 1, column 6 indicates that the domestic banks had higher average NIM (26.65%) than that of public banks (12.51%) and joint venture banks (21.30%). It means domestic banks were able to maintain good asset quality.

While comparing the individual banks, the result was very different from the average values. Though ADBL is a public sector bank, it was occupied first position with the highest interest margin of 5.61% while SBL, a domestic private bank, was in the last position with lowest interest margin of 1.90%.

The interest margin of EBL, a joint venture bank, was 4.75% and ranked in second position. Among the all commercial banks only ADBL, NABIL, EBL and LBL were maintained minimum level. It seems the profitability of the banks in Nepal was not so satisfactory.

**Liquidity**

The credit to deposit ratio (CDR) is a major tool to examine the liquidity of a bank and measures the ratio of fund that a bank has utilized in credit out of the deposit total collected. Higher the CDR more the effectiveness of the bank to utilize the fund it collected.

As per the Table 1, column 7, the CDR of the public banks shows that their liquidity position was lower than the accepted level. However, ADBL was seemed to more efficient to utilize their funds collected as deposit. During the study period, the average CDR of NBL was 39.58% while that of RBBL was 51.14% and ADBL was 111.01%.

Although there is no standard for CDR in Nepal, a ratio of 75% can be accepted to be adequate. The CDR of the bank was quite consistent over the past five years beginning from 2005-2010. Among the six joint venture banks, the average CDR of NBBL was higher than other JV banks. In an average, the bank has been able to utilize two-third portion of the depositors fund in the form of credit. The CDR of domestic private banks was in the accepted level. The CDR of domestic private banks was higher than 75% level, which is adequate.

In order to rank the banks, SBL was the first one; it has an average CDR of 93.04%. The second position was for LBL bank with CDR equaled to 90.21%, and the last position was belonged to NIBL bank with 76.01%. It seems domestic private banks are efficient to utilize the funds collected as deposit.

**Ranking of the commercial banks**

Different commercial banks had different ranking based on each financial ratio related to ROA, ROE, CAR, NPL, IETTL, NIM and CDR (Table 2). Based on the bank return on assets, the higher rank was for RBBL, which is a public sector bank, SCBL Bank, was the second, which is joint venture bank and the last position, belonged to NCCBL, a domestic private bank. Based on return on
equity NCCBL belonged to first position, SCBL was second position and the lowest one was NBL. Based on capital adequacy ratio SCBL was first position, LXBL was second position and last position belonged to RBBL.

Based on the NPL ratio, LXBL was first position while KBL was second position and last position belonged to RBBL. Based on interest expenses to total loan, EBL was in the first position; NCCBL was occupied second position while the last position was for LBL.

Based on net interest margin, the first position was for ADBL while EBL was occupied the second position and SBL was in the last position. Based on credit to deposit ratio, ADBL was first position, SBL was second position and last position belonged to NBL.

**Correlation analysis**

The relationships among the study variables depicted in the model were tested using correlation with ROA and ROE separately with determinants of the bank’s profitability ratio, which is presented in Tables 3 and 4, respectively.

Results show that ROA was negatively correlated with CAR (-0.478), IETTL (-0.251) and CDR (-0.279) because of heavy accumulated loss and capital below prescribed limit in the public banks in Nepal.

Moreover, improper calculation of risk weighed exposure also made CAR to be negatively correlated with ROA. The negative coefficient estimates of the correlation resulted in these ratios had inverse relationship with ROA. In contrast, NPL (0.289) was positively correlated with ROA depicts that the commercial banks in Nepal could effectively manage its credit risk. NIM (0.314) was also found positively correlated with ROA. The positive coefficient estimates of the correlation implied that there was direct relationship of NPL and NIM with ROA.

It can be seen that ROE was positively correlated with CAR and CDR. It indicates that an increase in CAR or CDR will lead to an increase in ROE while NPL, IETTL and NIM was found independent with the ROE because NPL, IETTL and NIM were negatively correlated.

The coefficient of correlations for CAR (+0.619), CDR (+0.177), NPL (-0.465), IETTL (-0.167), NIM (-0.009) respectively, clearly show that none of the variables were strongly correlated with ROE. The statistics also indicate that none of the variables in both cases was strongly correlated. Hence, there appeared to be no multi co-linearity problems. These have also been verified using variance inflation factor (VIF).

**Regression statistics for the models (A) and (B)**

The regression results for the commercial banks including the government, joint venture and domestic private banks are presented in Table 5. In the model (A), the value of R-square was 0.621, which means that 62% of the total variation in the value of ROA was due to the effect of the independent variables.

The adjusted R square was 0.464. This shows that on an adjusted basis, the independent variables were collectively 46.4% related to the dependent variable ROA. Durbin-Watson (DW) statistics is the ratio of sum of squares of successive differences of residuals to the sum of squares of errors. As a rule of thumb, if the DW statistic is less than 2, there is evidence of positive serial

---

**Table 3. Correlation between ROA and other financial ratios.**

<table>
<thead>
<tr>
<th></th>
<th>ROA</th>
<th>CAR</th>
<th>NPL</th>
<th>IETTL</th>
<th>NIM</th>
<th>CD</th>
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<tbody>
<tr>
<td>Pearson correlation</td>
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<td></td>
<td></td>
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<tr>
<td>ROA</td>
<td>1.00</td>
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<td>0.289</td>
<td>-0.251</td>
<td>0.314</td>
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</tr>
<tr>
<td>CAR</td>
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<td>-0.825</td>
<td>-0.274</td>
<td>-0.106</td>
<td>0.513</td>
</tr>
<tr>
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<td>0.302</td>
<td>0.268</td>
<td>-0.226</td>
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<td>0.251</td>
<td>0.171</td>
</tr>
<tr>
<td>NIM</td>
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<td>0.096</td>
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**Table 4. Correlation between ROE and other financial ratios.**

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<th>CAR</th>
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<th>IETTL</th>
<th>NIM</th>
<th>CD</th>
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<tr>
<td>Pearson correlation</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>0.619</td>
<td>-0.465</td>
<td>-0.167</td>
<td>-0.009</td>
<td>0.177</td>
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<tr>
<td>CAR</td>
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<td>-0.825</td>
<td>-0.274</td>
<td>-0.106</td>
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<tr>
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Table 5. Coefficient analysis and collinearity statistics for the dependent variable ROA.

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<tr>
<th>Model</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
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<th>Sig.</th>
<th>Collinearity statistics</th>
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<td>Std. Error</td>
<td>Beta</td>
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<td>Tolerance</td>
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<td></td>
<td>2.803</td>
<td>0.016</td>
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<td>-1.228</td>
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<td>NPL</td>
<td>-0.047</td>
<td>0.027</td>
<td>-0.619</td>
<td>-1.726</td>
<td>0.110</td>
</tr>
<tr>
<td>IETTL</td>
<td>-0.377</td>
<td>0.137</td>
<td>-0.561</td>
<td>-2.762</td>
<td>0.017</td>
</tr>
<tr>
<td>NIM</td>
<td>0.362</td>
<td>0.150</td>
<td>0.464</td>
<td>2.413</td>
<td>0.033</td>
</tr>
<tr>
<td>CD</td>
<td>0.010</td>
<td>0.009</td>
<td>0.263</td>
<td>1.084</td>
<td>0.300</td>
</tr>
<tr>
<td>R-squared</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durbin-watson stat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Coefficient analysis and collinearity statistics for the dependent variable ROE.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Collinearity statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>(Constant)</td>
<td>19.372</td>
<td>24.677</td>
<td></td>
<td>0.785</td>
<td>0.448</td>
</tr>
<tr>
<td>CAR</td>
<td>1.177</td>
<td>0.560</td>
<td>1.048</td>
<td>2.103</td>
<td>0.047</td>
</tr>
<tr>
<td>NPL</td>
<td>0.565</td>
<td>0.823</td>
<td>0.299</td>
<td>0.686</td>
<td>0.506</td>
</tr>
<tr>
<td>IETTL</td>
<td>1.254</td>
<td>4.160</td>
<td>0.074</td>
<td>0.301</td>
<td>0.768</td>
</tr>
<tr>
<td>NIM</td>
<td>0.650</td>
<td>4.566</td>
<td>0.033</td>
<td>0.142</td>
<td>0.889</td>
</tr>
<tr>
<td>CD</td>
<td>-0.293</td>
<td>0.278</td>
<td>-0.310</td>
<td>-1.054</td>
<td>0.313</td>
</tr>
<tr>
<td>R-squared</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durbin-watson stat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

correlation (Büyüksalvarcı and Abdioğlu, 2011).

The Durbin-Watson statistic was 2.489; it means that there was no serial correlation between independent variables and ROA. The relationship of the capital adequacy ratio was to be found negative and the coefficients were statistically significant (p< 0.05). The coefficient was -0.055, which depicts that the relationship might not be very strong.

However, it is clear that the weak negative relationship was due to the large volume of negative reserves of the two public banks, namely NBL and RBBL. The capital base still was a long way to achieve minimum capital requirement. In other side, NPL ratio was negative but insignificant. It is clear that there was a negative relationship between poor asset quality. This means the commercial banks, which failed to monitor their credit loans tend to be less profitable than those which paid particular attention to the assets quality.

IETTL was negatively significant with ROA at 5% level. It means a 0.561-point increase in IETTL will result in an on decrease of 1 point of ROA. The Net interest margin ratio and credit to deposit ratio recognized the positive relationship respectively, whereas NIM statistical coefficients was significantly affected by the performance. NIM will result in an on 0.464 point increase in NIM will result in a increase of 1 point of ROA and the result also exhibit that banks management has been able to keep the growth of interest income ahead of interest expenses. CD ratio was insignificantly affected. This exposes that increase in the level of credit to deposit significantly increased ROA of the banks by 0.263.

CDR was insignificant because the banks were not efficiently utilizing the funds collected as deposit. By analyzing variance inflation factor in ROA model, it can be said that all independent variables had tolerance value greater than 0.1. The results can prove that all variables had VIF value less than 10. This finding suggests that multicollinearity was not a problem when selected explanatory variables were used to develop the predicted model in the logistic regression analysis and to validate the evidence presented in correlation matrix.

Table 6 in the model (B) indicates that the value of R-square was 0.443, which means that 44.3% of the total variation in the value of ROE was due to the effect of the independent variables. The adjusted R square was 0.211. This shows that on an adjusted basis, the independent variables were collectively 21% related to the dependent variable ROE.

The Durbin-Watson statistic was 2.355; it means that there was no serial correlation between independent
variables and ROE. The relationship of the CAR was positively significant at 5% level while the other variables (NPL, IETTL, NIM, and CDR) were insignificant.

NPL was insignificant because of the result of poor credit policy including depraved appraisal and inadequate follow-up and supervision of loan distribution eventually. The IETTL and NIM ratio were positive but statistically insignificant. CD ratio was negative but insignificant because commercial banks are not concentrating more on credit and investment. More credit flows are required to verge on the optimum CD ratio.

By analyzing variance inflation factor in ROE model, it can be said that all independent variables had tolerance value bigger than 0.1. The results can prove that all variables have VIF value less than 10. This finding suggests that multicollinearity was not a problem when selected explanatory variables were used to develop the predicted model in the logistic regression analysis and to validate the evidence presented in correlation matrix.

The R square for ROA (0.621) was determined higher than ROE (0.443), suggesting the CAMEL framework appears to influence ROA better than ROE. In ROA model, the result shows that capital adequacy ratio, interest expenses to total loans, net interest margin significant while non-performing loan ratio and credit to deposit ratio were not significant. For that reason, hypothesis 1, 3 and 4 have been accepted and have a significant impact on performance of the commercial banks in Nepal and reject hypothesis 2 and 5 by accepting alternative null hypotheses.

In ROE model, only capital adequacy ratio was significant while other variables non-performing loan ratio, interest expenses to total loans ratio, net interest margin ratio, credit to deposit ratio were not significant. Therefore, hypothesis 1 has been accepted while hypothesis 2, 3, 4 and 5 have been rejected by accepting alternative null hypotheses.

Conclusions

Though financial ratios analysis compares the financial performance among commercial banks, the same bank had different ranks under the different financial ratios. The ROAs of public sector banks were higher than those of joint venture and domestic public banks due to having utmost total assets but the overall performance of public sector banks was not observed sound because other financial ratios including ROE, CDR, and CAR of most of the joint venture and domestic public banks were found superior.

High overhead costs, political interventions, poor management and low quality of collateral created continued deterioration in the financial health of the public sector banks.

The values determined for the financial ratios reveal that joint venture and domestic public banks are also not so strong in Nepal to manage the possible large-scale shocks to their balance sheet.

Furthermore, it can be concluded from the multiple regression analysis that the capital adequacy ratio, interest expenses to total loan and net interest margin were significant but had a negative effect on ROA while non-performing loan and credit to deposit ratio did not have any considerable effect on ROA. The capital adequacy ratio positively influenced the return on equity but the non-performing loan, credit to deposit ratio, interest expenses to total loan and net interest margin had no significant effect on ROE.

REFERENCES


Full Length Research Paper

Optimal supplier number of a supply chain company under stochastic demand

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This paper seeks to provide academic researches with a better understanding about the determination of supplier number to control supply chain risk. By introducing multi-supplier strategy and some assumptions of the suppliers, a supply chain model based on traditional newsvendor model is proposed. This model considers both supply risk and demand risk. A nonlinear integer programming model is built to determine an optimal supplier number of this supply chain, and the risks under this model are analyzed. Simulations are also made to test this model under different market demand distribution. This paper presents a supplier number determination model which can maximize expected profit of a supply chain company under supply risk and demand risk (stochastic demand).

Key words: Supply chain, supply chain risk, risk analysis, stochastic demand.

INTRODUCTION

As performance of modern enterprises rely heavily on their supply chain, competitions between them have become those of supply chain. All members on the chain are closely related with each other, which mean any broken links could be a deathblow to the chain as a whole. Such broken links could not only be resulted from failure of reputation and operation of a company but also from unexpected factors like natural disasters, terrorism, war, sickness, etc (Chopra and Sodhi, 2004). Well-known examples include the fire in New Mexico on March 17, 2000, which caused damage of millions of microchips and a sharp decline of market share of Ericsson in mobile phone. Another example is Ford who had to close down some factories due to the September 11 Terrorist Attacks. Besides broken risk, supply chains have to face with another risk stemmed from the stochastic demands at the same time.

This research studies method of selecting an optimal supplier number to maximize the expected revenue of a supply chain company under supplier failure risk and stochastic demands. The results are valuable in reducing supply chain risk including supplier failure risk and demands risk. In order to consider these two kinds of supply chain risk, a multi-supplier model was proposed. This model is based on traditional newsvendor model, in which optimal stock quantity is displaced by optimal supplier number. Theoretical analysis and simulation show that, in this model, the risk of supply shortage will close to zero and the stock quantity will close to expected market demand under sufficient supplier.

This paper is organized as follows; brief literature review on related fields containing supply chain risk control, supplier selection, and newsvendor model, etc; background and some assumptions of the model; model and risk analysis; example and simulations; conclusions, managerial implications and directions for future work.

LITERATURE REVIEW

As supply failure accounts for a large proportion of supply chain risks, it has been taken as one of the most important research areas of supply chain risk management. Cranfield Management School studied the risk factors of supply chain in their research project “Supply Chain Vulnerability”, and perceived supply risk as one of the six risk factors (Peck, 2005). Sheffi (2001) studied the impact of international terrorism on supply

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chain, and pointed out that terrorism can cause delay or unavailability of materials from suppliers, and thus, leading to a supply shortage which would paralyze activities of a company. Hallikas et al. (2004) studied the process of risk management in supplier networks. He divided the risks in supplier network into four categories:

1) Too low or inappropriate demand
2) Problems in fulfilling customer deliveries
3) Cost management and pricing
4) Weaknesses in resources, development and flexibility.

In this research, Hallikas et al. (2004) also advanced a semi-quantitative method to assess supplier network risks. He divided risk impacts into five ranks, as well as risk probability. Then, he showed them in a risk diagram. By doing this, the most important risk gets the most important concern, and this method illustrated that the effective way to reduce supply network risks is to reduce the combination of risk probability and risk impact.

Supply risks include all the vulnerability in the logistic process from supplier to a company. But the most important factor is the reliability of suppliers. Reliable suppliers can significantly reduce supply risk, and supplier selection therefore becomes an important research area of supply chain risk management. Ting and Cho (2008) took supplier selection as a multi-criteria decision problem. They used analysis hierarchy process (AHP) to assess suppliers and built a multi-objective linear programming model to calculate optimal order quantity of the suppliers. Sevki et al. (2008) proposed a new approach called “analytical hierarchy process weighted fuzzy linear programming model (AHP-FLP)” for supplier selection. They found that AHP-FLP method is better than the AHP method for supplier selection with respect to restricted supplier selection criteria. Besides these researches, Taguchi loss functions (Ordoobadi, 2009) and data envelopment analysis (DEA) (Liu et al., 2000) were also used to study supplier assessment and selection problems.

Such researches on supplier selection mainly focused on supplier assessment. However, supplier number is also an important factor of supply risks. The problem whether to choose single sourcing strategy or multiple sourcing strategy has been studied using different methods (Hong and Hayya, 1992; Ghodsypour and O’Brien, 2001). Multiple sourcing strategies may cause longer management time and higher operation cost, and result in supply delay and production plan disruption. And companies, at the same time, have to bear additional costs such as technology, professional knowledge, quality control and transportation. Therefore, traditional management theories like “Just in time” emphasize on simplifying supply chain and reducing management complexity with a view to reducing costs,. From the perspective of the total cost of sourcing, it is supposed that a small number of suppliers be selected and long-term partnerships be established (Bakos and Brynjolfsson, 1993). But in the light of risk aversion, companies should source from as many suppliers as possible. Smeltzer and Siferd (1998) point out that reducing supplier number will lead to higher supply risk, especially risk of disruption when there is single one supplier and when an earthquake, war or terrorist attack happens. In addition to reducing supply risk, multi-sourcing can also reduce the purchaser’s dependency on product quality, price and delivery, and help them obtain cheap but high-quality service due to the competition of suppliers. Investigation of Johnson (2001) on American toy industry shows that producers adopt multi-sourcing strategy and placing order to suppliers in various countries in Southeast Asia so as to avoid supply risk brought by foreign exchange fluctuation, natural disasters, political upheaval, etc.

Considering both risk aversion and cost reduction, selection of an optimal supplier number becomes extremely important for a company. Berger et al. (2004) built a decision-making process using decision tree. They considered two kinds of risk events, that is, “super-events” impacting many/all suppliers and “unique events” impacting only one supplier. In the decision process, they assumed that either all suppliers are down or not all suppliers are down. Ruiz-Torres and Mahmoodi (2005) improved Berger’s model and proposed a more realistic decision-making process by taking into consideration the independent risks of individual supplier failures when the probability of failure for each of the suppliers is equal and when it is not equal. In their model, partial failure of single supplier is considered.

These models consider only the risk on the supplying side. As a matter of fact, however, companies have to face with risks lying in stochastic demand. Newsvendor model provides a prototype to catch the demand risk. An optimal level of stock is determined in this model to estimate demand and maximize profit. Studies on this model mainly concentrated on price strategy and inventory strategy. Lin and Kroll (1997) investigated a single-item newsvendor model considering two types of quantity discount strategy. Their model “maximizes the expected profit subject to a constraint that the probability of achieving a target profit level is no less than a predetermined risk level”. Other related researches on newsvendor model include changing of model’s objective function (Kogan and Lou, 2003), constraint condition (Cherikh, 2000), model parameters and decision variables (Dana and Petruzzi, 2001), etc. Heuristic algorithms (Erlebacher, 2000), iterative algorithms (Abdel-Malek and Areratchakul, 2007), and convex programming theory (Niederhoff, 2007) were used to solve the models. Newsvendor model is a type of single-stage supply chain model, and does not consider factors of supplier. The model in this research combines supplier selection theory with newsvendor mode, and considers both supply risk and demand risk in determining optimal
also be higher as the order quantity is split. If suppliers of a company must balance supply risk and supplier cost mean higher purchase price. Therefore, decision makers than that of single-supplier strategy. Purchase cost may favorable in that the supply shortfall can be made up by working suppliers, and the risk impact can be decreased thereby. It is obvious that more suppliers would result in less supply risk. But the cost of management and coordination of multi-supplier strategy is much higher than that of single-supplier strategy. Purchase cost may also be higher as the order quantity is split. If suppliers adopt quantity discount strategy, multi-supplier would mean higher purchase price. Therefore, decision makers of a company must balance supply risk and supplier cost when determining the number of supplier.

Demand risk of supply chain comes from the uncertainty of market demand. As the ultimate purpose of a supply chain is to fulfill the need of customers, every company on the supply chain must forecast the demand to make a perfect production plan. Nevertheless, forecast does not always coincide with the real demand. This discrepancy results in oversupply or shortage which can cause lots of cost. Many scholars call this kind of uncertainty demand risk and regard it as a very important risk factor on supply chain (Harland et al., 2003; Tang, 2006). The aim of research on supply chain system under demand risk is to decrease the disruption of demand uncertainty and get an optimal stock quantity.

**Parameters of the model**

Based on former description and assumptions, a nonlinear integer programming can be built to determine an optimal supplier number, which enables a company to gain maximum return under lower risks. Variables used in this model are as follows:

a) $n$ is the supplier number of company $A$;
b) $r$ is market demand of $G$ to company $A$;
c) $f(r)$ is probability distribution of the market demand. It can be determined by market forecasting based on history data and operation experience. It follows $F(r) = \sum_{r=0}^{\infty} f(x)$ under discrete $r$, and $F(r) = \int_{0}^{r} f(x) dx$ under continuous $r$. In both discrete and continuous condition, $F(\infty) = 1$;
d) $X$ is maximum number of supplier in the market;
e) $s_i$ is the maximum supply of supplier $i$, where $i \leq n$. $s_i = \bar{s}$ means that all suppliers have the same maximum supply $s$;
f) $p_i$ is the probability of failure, or risk, of supplier $i$. $p_i = p$ if all single supplier have the same failure risk;
g) $v$ is the purchase price from suppliers. As all suppliers adopt quantity discount strategy, $v$ is a piecewise function as
\[
v(q) = \begin{cases} v_1 & 0 < q < q_1 \\ \vdots & \vdots \\ v_i & q_{i-1} \leq q < q_i \\
\end{cases},
\]
where $q$ and $q_i$ are purchase quantity from a supplier, and $v > v_1$;
h) $e$ is the sale price, and $e > v_1$;
i) $g(n)$ is the management cost of $n$ suppliers. It also includes fixed procurement costs, and it is an increasing function about $n$;
j) $k()$ is the shortage cost, and $j$ is the stockout quantity. It is also an increasing function.

**Assumptions**

In real supply chains, interactions including logistics,
information flow and capital flow are complex among a company and its suppliers and are all concerned with supply risk. Further more, risk factors are diverse in different companies, wherefore the model of risk forecasting and assessment are very complex. As a result, the following assumptions are made to simplify the model without losing its practical significance.

1) Suppliers are homogeneous and independent of each other: The homogeneity of suppliers means that they are the same for a demand-side company. All suppliers have the same risk and maximum supply, which are denoted by \( p \) and \( s \) respectively in this model, and adopt the same quantity discount strategy. Due to the homogeneity, a company always purchases the same quantity of goods from its suppliers.

   The independence of suppliers means that the risk probability of them is independent. Failure of a supplier does not affect others.

2) Supply of a supplier is either total success or total failure: This assumption means that the order would be canceled if a supplier becomes failure. And this order would be equally apportioned to other normally functioning suppliers.

3) A company can not change supplier within a short time: This assumption keeps the supplier number relatively steady.

4) Supply chain is agile enough, and the company has a credible contractual relationship with all its suppliers: This assumption ensures that a company's purchase quantity would not exceed market demand. A company can interact with suppliers effectively if the supply chain is agile enough. Moreover, with the credible contractual relationship, oversupply risk can be kept to an insignificant level.

5) Management cost and shortage cost: Management cost of \( n \) suppliers is \( g(n) \), where \( n \) is the number of supplier. And \( g(n) \) is an increase function about \( n \). Larger number of suppliers brings higher management complexity, and results in greater cost. To calculate easily, fixed procurement cost is included in \( g(n) \). From the fourth assumption, it can be concluded that demand risk is equal to the stockout probability. Then we assume that the shortage cost is \( k(l) \), where \( l \) is the shortage quantity. As the limited supply quantity of suppliers, demand risk is correlated to the number of supplier. As a result, a company must balance risks and supplier cost so as to maximize its revenue.

Based on these assumptions, the traditional newsvendor model is changed into a new model which considers both demand risk and supply risk. The company has to determine an optimal supplier number instead of an optimal stock quantity.

### Supply chain contracts in assumptions

As the model is simplified based on former assumptions, this section analyzes the feasibility of these assumptions. It is mainly about contracts between a company and its suppliers. And, in fact, two contracts, quantity discount contract and quantity flexibility contract, are hid in the assumptions.

Supply chain contract is the clause between supply chain members. It contains some incentives to optimize and coordinate the whole supply chain. Some important supply chain contracts include buy back contract (Padmanabhan and Png, 1995), quantity flexibility contract (Eppen and Iyer, 1997), wholesale price contract (Lariviere and Porteus, 2001), revenue sharing contract (Dana and Spier, 2001), quantity discount contract (Cachon and Lariviere, 2001), etc.

Quantity discount contract is always used for encouraging companies to increase its purchase quantity. Suppliers would give a company different discount according to its purchase quantity. That is to say, multi-supplier strategy could split purchase quantity and the company thus gets a relatively small discount. This is a kind of cost of multi-supplier strategy.

The fourth assumption ensures that a company does not have to deal with oversupply risk, and it simplifies the risk control model. Although, this assumption is not true in real supply chain, a delicate quantity flexibility contract can be used to decrease the oversupply risk to a negligible level. In a quantity flexibility contract, a company place and order before sales period, and determine final order quantity after getting the exact market demand. This paper mainly focuses on the determination of optimal supplier number to avoid supply chain risk. Hence, the supply chain contract will be studied in further work.

### MODEL AND RISK ANALYSIS

#### The model to balance the risk level and risk control cost

The ultimate purpose of supply chain risk control is to maximize the profit of the company. In this part, an integer programming model which considers supply risk and demand risk is built to maximize expected profit of a company. This model could find an optimal supply number to balance the risk and cost of risk control.

Firstly, two random events are given for the sake of following analysis.

1) \( N \) is the event that the company selects \( n \) suppliers;
2) \( l \) is the event that \( i \) suppliers function normally.

As the independent assumption of suppliers, following conditional probability can be got.

\[
P(I \mid N) = \binom{n}{i} (1-p)^i p^{n-i}.
\] (1)
Then, the probability that supply could meet market demand when the company selects \( n \) suppliers and \( i \) of them function normally is:

\[
P(r \leq i \cdot s \mid I, N) = P(I \mid N) \cdot F(i \cdot s) .
\]  

(2)

Then, the stockout probability is

\[
P(r > i \cdot s \mid I, N) = P(I \mid N) \cdot [1 - F(i \cdot s)] ,
\]  

(3)

The cost of multi-supplier strategy includes two parts. First is the opportunity cost caused by quantity discount policy of suppliers. As all suppliers are homogeneous, it can be known that the order quantities to all normally functioning suppliers are equal. Therefore, the discount is determined by \( v(\cdot) \) and \( i \). Another is the management cost, which is \( g(n) \).

If supply could meet market demand, the sale quantity is \( r \), and profit of the company is;

\[
R_1 = r \cdot [e - v(r / i)]
\]  

(4)

When supply can not meet market demand, the sale quantity is \( i \cdot s \), which is the maximum supply of all successful suppliers. Under this circumstance, the company also has to pay the shortage cost, and its profit is

\[
R_2 = i \cdot s \cdot (e - v(s)) - k(r - i \cdot s)
\]  

(5)

Then, if the company selects \( n \) suppliers, its profit can be calculated by:

\[
R(n) = \sum_{i=0}^{n} \left[ P(r \leq i \cdot s \mid N, I)R_1 \right] \\
+ \sum_{i=0}^{n} \left[ P(r \leq i \cdot s \mid N, I)R_2 \right] - g(n)
\]  

(6)

The number of suppliers in a market is always limited. And it is ever supposed that the maximum number of supplier in the market is \( X \). So, the risk control model of supplier number under stochastic demands is;

\[
\max R(n) \\
\text{s.t.} \begin{cases} 
0 \leq n \leq X \\
n \in \mathbb{Z}
\end{cases}
\]  

(7)

This model is a nonlinear integral program model and it has a complex object function. So, it is very difficult to get an analytical solution. Yet, it is relatively easy to use intelligence algorithm like genetic algorithm (GA) to get a numerical solution. On the other hand, it does not have to get an analytical solution both in the following analysis of this paper and in the application of this model by a supply chain company. In fact, a company always makes selection among few suppliers, and its decision-making is always limited within several integers. So, trial method is enough for a company to get an optimal supplier number using this model.

**Risks of the model**

This area analyzes risks of the afore-mentioned model. The purpose of risk control is to meet the market demand well, and then bring more profit to a company. In this case, this model synthesizes supply risk and demands risk into stockout probability, in which total supply of normally functioning suppliers can not meet market demand. Therefore, risk of this model is analyzed from two aspects, stockout probability and the company’s actual supply quantity.

When the company selects \( n \) suppliers, the probability that supply could meet market demand is;

\[
P(N) = \sum_{i=0}^{n} P(r \leq i \cdot s \mid I, N) = \sum_{i=0}^{n} P(I \mid N) \cdot F(i \cdot s)
\]  

(8)

Then, the stockout risk when the company selects \( n \) suppliers is;

\[
P_r = 1 - P(N) .
\]  

(9)

When the company selects \( n \) suppliers, the expected number of successful supplier is \( n \cdot p \), and expected maximum supply quantity is \( n \cdot p \cdot s \). Larger supplier number can make the company meet a larger expansion of market demand, and get a larger \( P(N) \). If \( n \) is large enough, the stockout risk \( P_r \) would tend to zero.

The company’s expected actual supply quantity when it selects \( n \) suppliers and \( i \) of them supply successfully is;

\[
S^i_E = \sum_{r=0}^{i} r \cdot f(r) + i \cdot s \cdot \sum_{r=i+1}^{\infty} f(r)
\]  

(10)

So, the expected actual supply quantity of \( n \) suppliers can be obtained as:

\[
S_E(n) = \sum_{i=0}^{n} P(I \mid N)S^i_E
\]  

(11)

Like the analysis of stockout risk, if \( n \) is large enough, the company can get sufficient goods to meet market demand. With the credible contractual relationship of a company and its suppliers, the risk of oversupply can be avoided. Therefore, sufficiently large supplier number can make expected actual supply quantity of the company close to expected market demand. But, following proof
shows that expected actual supply quantity is always less than expected market demand.

Firstly, let

$$T = S(n) - \sum_{i=0}^{\infty} rf(r)$$

and following proofs shows that $T < 0$.

As $\sum_{i=0}^{\infty} P(I|N)=1$, expected market demand then can be represented as:

$$\sum_{i=0}^{\infty} rf(r) = \sum_{i=0}^{\infty} P(I|N)\sum_{i=0}^{\infty} rf(r)$$

(13)

Then, it can be obtained that

$$T = \sum_{i=0}^{\infty} P(I|N)S_E - \sum_{i=0}^{\infty} rf(r)$$

$$= \sum_{i=0}^{\infty} P(I|N)[S_E - rf(r)]$$

$$= \sum_{i=0}^{\infty} P(I|N)\left[ \sum_{i=0}^{\infty} (i \cdot s - r)f(r) \right] < 0$$

(14)

EXAMPLE AND SIMULATIONS

In this area, the risk control model is tested by an example. Simulation results include the changing of company's expected profit, risk, expected actual supply quantity along supplier numbers. The relationships of company's maximum profit and other parameters, including maximum supply quantity of a single supplier, shortage cost and management cost, are also given.

The following are the parameters of this example:

1) All suppliers adopt following quantity discount strategy:

$$V(q) = \begin{cases} 10 & 0 < q < 5 \\ 9 & 5 \leq q < 10 \\ 8 & 10 \leq q < 15 \\ 7 & 15 \leq q \end{cases}$$

2) Supply risk of a single supplier, $p = 0.1$;
3) Management cost, $g(n) = 10n$;
4) Shortage cost, $k(l) = 5l$;
5) Company's sale price, $e = 15$;
6) Maximum supply quantity of a single supplier, $s = 20$.

Three kinds of market demand distribution are analyzed in the example, including

1) Discrete uniform distribution $f(r) = 0.01, 0 \leq r \leq 99, r \in N$
2) Normal distribution $f(x) = N(50,50/\sqrt{3})$
3) Poisson distribution $f(x) = P(\lambda = 50)$

It should be noticed that these three distributions have equal mathematical expectation, and variances of discrete uniform distribution and normal distribution are also equal.

Figure 2(a) shows that, under these three distributions, company's profits increase at first and then decrease. As expectation and variances of both discrete uniform distribution and normal distribution are equal, the two profit lines are almost overlapped. Figure 2 b and c show that if the company has enough suppliers, the risk would approach zero rapidly, and the expected actual supply quantity would be close to expected market demand.

Under all these three distributions, maximum profit of the company is a positive correlation with maximum supply quantity of single supplier, and a negative correlation with optimal supplier number (Table 1). To
Table 1. Influence of the maximum supply quantity (MaxSQ) of single supplier on company's maximum profit (MaxP) and optimal supplier number (OSN) under different demand distribution.

<table>
<thead>
<tr>
<th>MaxSQ</th>
<th>Discrete uniform distribution</th>
<th>Normal distribution</th>
<th>Poisson distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MaxP</td>
<td>OSN</td>
<td>MaxP</td>
</tr>
<tr>
<td>20</td>
<td>292.9</td>
<td>6</td>
<td>290.5</td>
</tr>
<tr>
<td>30</td>
<td>325.4</td>
<td>5</td>
<td>327.5</td>
</tr>
<tr>
<td>40</td>
<td>340.3</td>
<td>4</td>
<td>346.0</td>
</tr>
<tr>
<td>50</td>
<td>348.2</td>
<td>4</td>
<td>354.1</td>
</tr>
<tr>
<td>60</td>
<td>349.8</td>
<td>4</td>
<td>356.9</td>
</tr>
<tr>
<td>70</td>
<td>353.7</td>
<td>3</td>
<td>361.8</td>
</tr>
<tr>
<td>80</td>
<td>359.4</td>
<td>3</td>
<td>366.4</td>
</tr>
<tr>
<td>90</td>
<td>362.8</td>
<td>3</td>
<td>369.1</td>
</tr>
<tr>
<td>100</td>
<td>363.9</td>
<td>3</td>
<td>370.5</td>
</tr>
</tbody>
</table>

Table 2. Influence of shortage cost (SCost) of company's maximum profit (MaxP) and optimal supplier number (OSN) under different demand distribution.

<table>
<thead>
<tr>
<th>SCost</th>
<th>Discrete uniform distribution</th>
<th>Normal distribution</th>
<th>Poisson distribution</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>MaxP</td>
<td>OSN</td>
<td>MaxP</td>
</tr>
<tr>
<td>10</td>
<td>286.2</td>
<td>6</td>
<td>281.9</td>
</tr>
<tr>
<td>20</td>
<td>275.8</td>
<td>7</td>
<td>270.7</td>
</tr>
<tr>
<td>30</td>
<td>272.5</td>
<td>7</td>
<td>265.0</td>
</tr>
<tr>
<td>40</td>
<td>269.3</td>
<td>7</td>
<td>259.3</td>
</tr>
<tr>
<td>50</td>
<td>266.0</td>
<td>7</td>
<td>253.7</td>
</tr>
<tr>
<td>60</td>
<td>262.8</td>
<td>7</td>
<td>250.4</td>
</tr>
<tr>
<td>70</td>
<td>259.6</td>
<td>7</td>
<td>248.8</td>
</tr>
<tr>
<td>80</td>
<td>256.3</td>
<td>7</td>
<td>247.1</td>
</tr>
<tr>
<td>90</td>
<td>253.1</td>
<td>7</td>
<td>245.4</td>
</tr>
<tr>
<td>100</td>
<td>251.6</td>
<td>8</td>
<td>243.7</td>
</tr>
</tbody>
</table>

avoid shortage cost, the company must select more suppliers. So, shortage cost is a negative correlation with profit and a positive correlation with optimal supplier number (Table 2). The relations of management cost and maximum profit, as well as optimal supplier number, are shown in Table 3. Higher management cost causes the company to select fewer suppliers, and it even adopts single-supplier strategy.

CONCLUSIONS

A model has been presented to help decision makers to determine an optimal supplier number. The model aims at answering this basic question: assuming that the market demand of goods follows a kind of stochastic distribution, how should the firm find an optimal supplier number to minimize supply risk and demand risk to a right level? On the basis of the literatures on supply chain risk control and newsvendor model, a new model which considers both supply risk and demand risk (shortage risk) is devised. By balancing the cost of suppliers and benefit of risk control, an optimal supplier number can be determined to maximize the expected profit of a supply chain company. To examine validity of our model, some simulations of an example have been made. These simulations consider three kind of demands distribution: discrete uniform distribution, normal distribution and poisson distribution. Results show that our model can effectively find a proper supplier number to balance multi-supplier management cost and risk control level.

The main advantages related to our findings are summarized as follows:

1) Our model synthesizes supply risk and demand risk. The company only needs to consider whether its suppliers can meet market demand.
2) Supply chain company can decrease these risks to an appropriate level by determining only one parameter: supplier number.
3) This model limits the ability of suppliers. All suppliers have an upper limit of supply quantity. This is more
Table 3. Influence of management cost (MCost) of company’s maximum profit (MaxP) and optimal supplier number (OSN) under different demand distribution.

<table>
<thead>
<tr>
<th>MCost</th>
<th>Discrete uniform distribution</th>
<th>Normal distribution</th>
<th>Poisson distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MaxP OSN</td>
<td>MaxP OSN</td>
<td>MaxP OSN</td>
</tr>
<tr>
<td>10</td>
<td>292.9 6</td>
<td>290.5 5</td>
<td>317.8 4</td>
</tr>
<tr>
<td>20</td>
<td>242.9 6</td>
<td>240.5 5</td>
<td>287.3 3</td>
</tr>
<tr>
<td>30</td>
<td>194.7 5</td>
<td>199.2 4</td>
<td>257.3 3</td>
</tr>
<tr>
<td>40</td>
<td>154.7 5</td>
<td>159.2 4</td>
<td>227.3 3</td>
</tr>
<tr>
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<td>114.7 5</td>
<td>119.2 4</td>
<td>197.3 3</td>
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<td>74.7 5</td>
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<td>167.3 3</td>
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<tr>
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<td>34.7 5</td>
<td>45.7 3</td>
<td>137.3 3</td>
</tr>
<tr>
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<td>1.6 4</td>
<td>15.7 3</td>
<td>107.3 3</td>
</tr>
<tr>
<td>90</td>
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<td>0 0</td>
<td>77.3 3</td>
</tr>
<tr>
<td>100</td>
<td>-247.5 1</td>
<td>0 0</td>
<td>47.3 3</td>
</tr>
</tbody>
</table>

consistent with real supply chain as it is also a source of supply risk.

4) Our model extends the research of newsvendor model as it can be taken as a special newsvendor model which includes several risky suppliers.

Implementation of the proposed models to determine an optimal supplier number requires assessment of supplier risk and market demand distribution. So, this model can be integrated with other interrelated method and embedded in the decision support system of a company. This integrated method can provide the company an immediate and efficient method to select proper suppliers.

**DIRECTIONS FOR FUTURE RESEARCH**

However, current study has some limitations for further research. Firstly, it has not considered the risk of oversupply. To get a state of low oversupply risk, a proper contract must be found in further research. Secondly, this model supposes that all the suppliers have the same risk and maximum supply quantity. But this is not real in real supply chain. Further research can combine this model and other supplier selection model to determine how many and which suppliers can bring supply chain company maximum profit. Further more, our model has another implied assumption, where the company is a small one and cannot influence sales price. Further research can adopt an oligopoly market model to consider the company’s influence on sales price.

**ACKNOWLEDGEMENTS**

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UPCOMING CONFERENCES


Conference on Paradigm Shift in Innovative Business Management, Indore, India, 1 Dec 2012
February 2014

SIBR 2014 Kuala Lumpur Conference on Interdisciplinary Business and Economics Research, Kuala Lumpur, Malaysia

National Conference on Innovations & Advancements in Information Technology, Nerul, India

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March 2014

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