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Full Length Research Paper

Impact of just-in-time (JIT) inventory system on efficiency, quality and flexibility among manufacturing sector, small and medium enterprise (SMEs) in South Africa

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The paper presents the findings of the study that was conducted to investigate the impact of application of Just-In-Time (JIT) inventory management system in the manufacturing sector SMEs. Self-administered questionnaires were distributed to a sample of manufacturing sector SMEs in the food, wood and furniture, metals, non-metals and other industries. The study revealed that the majority of SMEs in the manufacturing sector were not applying the JIT inventory management principles. It was furthermore revealed that there are challenges impeding the implementation of JIT principles in the manufacturing sector SMEs. These challenges include lack of reliable supplier networks, lack of capital and lack of knowledge of immediate financial gains among others. Furthermore, statistically significant positive correlations between the application of JIT inventory management principles and cost efficiency, quality and flexibility were found. It is therefore deduced that manufacturing sector SMEs can benefit significantly in terms of improved quality of products, increased operational cost cuts and increased flexibility by applying the JIT inventory management principles.

Key words: South Africa, just-in-time, efficiency, quality, flexibility, small and medium enterprises.

INTRODUCTION

The 21st century economy demands that businesses explore different approaches to cut operational costs and offer competitive prices in order to survive and grow. According to Talha (2002), in order to compete effectively, companies must be capable of manufacturing high quality products at a low cost, and also provide a first class customer services. In addition, they must have the flexibility to cope with short product life cycles, demands for greater product variety from more discriminating customers and increasing international competition. In South Africa, small and medium enterprises (SMEs) in the manufacturing sector are faced with a great challenge of fighting competition with large established businesses. To compete in such an environment continuous improvements both in operations, quality and customer service are essential and these require access to and management of a sustainable financial resources. In addition to the competition with large businesses, SMEs in South Africa are faced with another problem of financial constraints. Several studies in South Africa (Maas and Herrington, 2006; Mutezo, 2006, Herrington et al., 2008; Musara and Fatoki, 2011) revealed that access to financial resources in the SME sector is one of the major challenges resulting in the high failure rates of SMEs in South Africa. It is therefore imperative for SMEs to seek approaches to cut their costs, achieve greater efficiency, offer superior quality and customer service and keep abreast with the ever-changing customer demands.

One of the approaches which have long been proven effective in the manufacturing sector in cutting costs, improving quality, productivity, efficiency and decreasing waste is the just in time (JIT) management approach. JIT is a management approach which originated in Japan in

the 1950s. It was subsequently adopted by Toyota and many Japanese manufacturing establishments with considerable success in raising productivity by eliminating waste (Kaneko and Nojiri, 2008). Since its wide application in manufacturing in the 1970s, JIT has been widely recognised as an operations management approach designed for manufacturing firms to improve performance through waste reduction. According to Chase et al. (2006), waste in Japan, as defined by Toyota's Fujio Cho, is 'anything other than the minimum amount of equipment, materials, parts, and workers (working time) which are absolutely essential to production'. JIT has the effect of releasing the much needed capital and lessen the burden of SMEs of the need to keep excessive inventories. Kyobe (2004) revealed that JIT arrangements can provide the firm with greater negotiating power to ensure prompt deliveries thereby reducing stock. The management philosophy underlying JIT is to continuously search for ways to make processes more efficient with the ultimate goal of producing goods or services without incurring any waste.

Approaches to cut operating costs are of great importance as way of solving the problem of financial constraints faced by many SMEs. SMEs must seek approaches to drive up customer value and at the same time reducing costs. This can be achieved through approaches aimed at reducing costs, improving product and service quality, increasing operational efficiency and being flexible and have the ability to meet the ever-changing customer demands. Just in Time inventory management is such an approach.

Therefore this paper investigates the use of JIT by manufacturing sector SMEs in the Eastern Cape Province of South Africa. Factors which impede the application of JIT inventory management system by manufacturing sector SMEs will be investigated. Furthermore, the effects of JIT on cost efficiency, quality and flexibility are empirically investigated.

Research problem

Several studies in South Africa (Mutezo, 2006; Maas and Herrington, 2006; Angela and Motsa, 2006; Herrington et al., 2008; Musara and Fatoki, 2011) have alluded to lack of access to financing as one of the major challenges impeding the survival and growth in the SME sector. However, little has been done to find solutions to address this challenge and to explore various approaches through which SMEs can effectively manage their little hard to find financial resources. Proper inventory management, particularly in the manufacturing sector is one of the ways through which operational costs cuts can be achieved. The study attempted to find the solution to inventory management through the JIT inventory management approach. The application of JIT inventory management approaches in developed countries and in other large established businesses in developing countries has been proven effective in reducing waste, reducing inventory holding costs, fostering flexibility to customer demands and improving quality. The questions arise; can this approach be applied by SMEs in the manufacturing sector in developing countries, South Africa in particular? What are the factors impeding the use of JIT inventory management approach by manufacturing sector SMEs in South Africa? What are the effects of JIT inventory management approach on cost efficiency, quality and flexibility of SMEs in the manufacturing sector in developing countries? Providing solutions to these questions through empirical investigations is the focus of this paper.

Objectives

The paper attempted to achieve the following objectives:

1) To investigate the application of JIT inventory management among SMEs in the manufacturing sector.
2) To investigate the factors which impede the application of the JIT inventory management approach among SMEs in the manufacturing sector.
3) To investigate the effects of JIT inventory management approach on cost efficiency, quality and flexibility of SMEs in the manufacturing sector.

Hypothesis

$H0_1$: There is lack of application of JIT inventory management approach among SMEs in the manufacturing sector in South Africa.
$H0_2$: There are no significant differences on the mean responses of SMEs in the manufacturing sector on the factors which hinder their application of the JIT inventory management approach.
$H0_3$: The JIT inventory management approach has no significant effects on:

1) Cost efficiency,
2) Quality,
3) Flexibility of SMEs in the manufacturing sector.

LITERATURE REVIEW

The JIT inventory management approach received a lot of attention of scholars. JIT inventory management as a tool to cut operational cost has been discussed by several authors (Sohal et al., 1993; Mehra and Inman, 1995; White and Pearson, 2001; Pheng and Min, 2005; Adeyemi, 2010) in the context of large enterprises. JIT production is a method of reducing inventory that has been used for many years however, its application to

SMEs in South Africa has not been investigated. Literature regarding the application of JIT in SMEs, particularly in South Africa and other developing economies is scant.

The implementation of JIT inventory management system requires a well crafted and established infrastructure such as an efficient transport system, an electronic information network and a reliable source of supplies, etc. Kaneko and Nojiri (2008) explained that for JIT to be successfully implemented both the manufacturer and supplier should share their information through a reliable electronic information network. Furthermore, successful implementation of JIT requires long term relationships between manufacturer and suppliers who have been selected according to the typical criteria such as quality, low-costs and punctual delivery. The relationship provides benefits to both producers and suppliers in the form of generating profit; reducing transaction costs and developing technology together (Kaneko and Nojiri, 2008). Such qualities might not be present in the SME sector.

Overall, the role of inventory management as a tool to cut costs in the SME sector received little attention of scholars and policy makers. However, significant operational cost cuts can be achieved through efficient inventory management systems. In a study in India's machine tools SMEs, Pillai (2010) reviewed that SMEs are aware of the importance of inventory management practices. However, when it comes to practice, almost 25% of them did not pursue any kind of inventory management practice. This is primarily due to lack of motivation as well as lack of perception of immediate financial gains. Pillai (2010) found that proper inventory management practices results in lower inventory costs. It was further argued that it is appropriate to encourage SMEs to adopt better inventory management practices because that would enable them to achieve lower inventory cost per sales and higher inventory turnover ratios.

In another study, Lee (2006) revealed that many Chinese small manufacturing firms face size-related difficulties in implementing JIT. The lack of bargaining power with suppliers and lack of capital are major hindrances encountered by Chinese small firms when implementing JIT. As a result, they focus on internal changes to improve quality, inventory reduction and increasing employee participation. Lee (2006) further suggested that Chinese small firms can achieve these goals by implementing only feasible elements of JIT without too much capital investment. This is a reason why many Chinese small manufacturing firms should consider JIT systems. In a study by Adeyemi (2010) in Nigeria, it was reviewed that JIT inventory management approach can be workable in Nigeria firms. However, many companies, especially small firms showed lack of awareness of its existence and how to apply the approach. Such discoveries can also be scrutinised in South African context to find similarities and ways of benefiting the SMEs sector to achieve operational costs cuts.

The application of JIT approaches has been proven successful in developed countries and in large businesses. The contentious questions regarding the application of JIT in SMEs in developing countries are: Does the state of infrastructure support successful implementation of JIT approach? What is the state of manufacturer to supplier relationships of SMEs in South Africa and can that relationship foster an environment for JIT implementation.

The study at hand attempt to investigates the use, the factors which impede the application of JIT inventory management and the effects of JIT on cost efficiency, quality and flexibility of SMEs in the manufacturing sector in South Africa.

METHODOLOGY

The empirical study was approached from the perspective of a formal research design through the definition of the study population, the incorporation of suitable measuring instrument and reliable techniques for data analysis as stipulated in Cooper and Schindler (2008). The population of this study consisted of all SMEs in the manufacturing sector in the Eastern Cape province of South Africa. The details of the populations was obtained from Statistics South Africa (StatSA) and Companies and Intellectual Properties Registration Commission (CIPRC). The study used the probability sampling method. The sample size was calculated using the Raosoft sample size calculator using a margin of error of 5, 95% confidence levels and a 50% response distribution (Raosoft, 2010). The sample size calculator yielded a minimum recommended sample size of 78 SMEs. However, 82 questionnaires were distributed to provide for non-responses. The sample is small enough to allow for the feasibility of the study and yet large enough to be a true representative of the targeted population.

A 25 item questionnaire was developed from literature review and information from subject matter experts. Three subject matter experts validated the questionnaire. Their corrections and suggestions were used to produce the final copy of the questionnaire. Split-half technique and Pearson product moment correlation method were adopted to determine the internal consistency of the instrument. A reliability coefficient of 0.82 was obtained. 82 questionnaires were distributed to SMEs in the manufacturing sector. Weighted mean and standard deviation were used to answer the research questions, while t-test statistic was used to test the hypothesis of no significant difference. Correlation between variables was tested using the Spearman correlation method.

RESULTS

This aspect entails a summary and discussion of statistical analyses and findings of the study at hand. Statistical analyses that were performed include descriptive statistics, cross-tabulations and Spearman correlation analysis.

Sample description and descriptive analysis

A total of 82 SMEs participated in the study and four sectors were identified, namely the food manufacturing sector, wood and furniture sector, metals sector, non-

Table 1. Use of JIT by sector.

Sector	% use	% non-use	% not sure	Total
Food	18.2	22.7	4.1	45
Wood and furniture	3.2	25.7	0.1	29
Metals	4.4	2.1	0.3	6.8
Non-metals	1.8	10	0.2	12
Others	0.4	5.9	0.9	7.2
Total	28	66.4	5.6	100

metals sector and others. 45% of the SMEs were in the food sector, 29% in wood and furniture, 6.8% in metals, 12% in non-metals and 7.2% others. This implies that the majority of SMEs that participated in this survey was in food manufacturing sector. In terms of size, the average manufacturing firm was found to have employed 100 employees and the average annual turnover was R26.4 million. This indicates that the majority of firms that participate in the survey were medium enterprises. In 93% of the surveyed firms, the person interviewed was the operations manager or the equivalents, and only 7% were owner managers of the firms.

Use of just-in-time (JIT) in firms

The respondents were asked if their firms were applying JIT principles. The majority of the respondents (66.4%) indicated non-application of the principle. 28% indicated use of JIT principle, while 5.6% were not sure. The results indicate that the majority of the firms are not applying the JIT principles. Of the 66.4 who indicated non-use of the JIT principles, 57% indicated lack of knowledge of the principle. There is therefore a need to educate and encourage SME owners to apply the JIT principles in order to help in serving costs. Table 1 show the reason for non-use of JIT by respondents classified by sector.

The results in Table 1 indicate that the majority of non-use respondents were in the wood and furniture sector, followed by the food sector. The majority used were from the food sector.

Challenges in the application of just-in-time (JIT)

Table 2 show the challenges in the application of JIT in the opinions of the respondents. The majority of respondents (52.9%) pointed out that lack of reliable supplier networks was the major challenge in application of the JIT principle. Lack of capital was second, with 19.6%, followed by lack of knowledge of financial gains and lastly lack of capacity, 8.8%. It can therefore be deduced that the greatest challenge in application of JIT principles centres on lack of reliable supplier networks. This is one of the most important prerequisite for a successful implementation of JIT philosophy. The means, standard error, median minima and maxima for the identified challenges in implementing the JIT principles were further computed and the results are presented in Table 3.

The means for these factors show that, on average, SMEs agree that lack of reliable supplier networks, lack of capital, lack of knowledge of financial gains and lack of capacity are the major challenges impeding their application of JIT principles. The results also show that there are no statistically significance differences (p-value>0.05) in the mean responses about the challenges hindering the application of JIT principles.

The results in Table 4 shows a statistically significant positive correlation (p-value<0.05), between the use of JIT principles and cost efficiency, quality improvements and flexibility. The highest correlation is found between use of JIT principles and flexibility ($r = 0.8711$; p-value = <0.0001). These results suggest that applying the principles of JIT will result in positive results on cost efficiency, quality improvements and flexibility. On the other hand, negative correlations were found between non-use of JIT principles and cost efficiency, quality and flexibility.

DISCUSSION AND MANAGERIAL IMPLICATIONS

Given the enormous potential benefits of applying the JIT principles, the findings that the majority of SMEs in the manufacturing sector are not applying JIT inventory management is quite disturbing. SMEs in the manufacturing sector, particularly in the food sector, can benefit a lot in terms of reduced storage costs, low loss of products due to obsolescence and lower inventory holding costs. Furthermore, the results of the study found a statistically significant positive relation between the application of JIT inventory management philosophy and improved quality and flexibility. Such a positive influence can be of great benefit to the SME sector, given the challenges of operating in the 21st century economy which is bombarded by ever-changing customer needs and increasing levels of competition from both existing and new innovative businesses. Surviving in the 21st

Table 2. Challenges in the application of JIT by sector.

Sector	Lack of reliable supplier networks	Lack of capital	Lack of knowledge of financial gains	Lack of capacity	Total
Food	27.7	5.1	8.2	4.0	45
Wood and furniture	13.2	5.7	9.1	1.0	29
Metals	2.0	3.0	0.3	1.5	6.8
Non-metals	9.6	2.0	0.2	0.2	12
Others	0.4	3.8	0.9	2.1	7.2
Total	52.9	19.6	18.7	8.8	100

Table 3. Means, standard error, median, minima and maxima of challenges.

Factor	N	Mean	Standard error	Median	Minimum	Maximum
Lack of reliable supplier networks	82	4.24	0.06	4.40	1.40	5.00
Lack of capital	82	3.49	0.04	3.71	1.43	4.71
Lack of knowledge of financial gains	82	3.79	0.05	4.00	1.00	5.00
Lack of capacity	82	3.96	0.05	4.00	1.00	5.00

Table 4. Spearman correlation analysis.

	Cost efficiency	Quality	Flexibility
Use of JIT	0.4979	0.5449	0.8711
	<0.0001	<0.0001	<0.0001
Non-use of JT	-0.1968	-0.0920	-0.2607
	<0.0052	<0.1949	<0.0002

century business economy requires flexibility, innovations and finding approaches to prove the best customer value at competitively lower cost. Applying the JIT inventory management principles can be a step forward surviving the harsh realities of the modern business economy.

Emanating from the challenges in applying the JIT principles, there is a need to build strong supply networks between the SMEs and their suppliers. It is therefore recommended that SMEs in the manufacturing sector should be taught the principles of JIT inventory management and the best ways of applying the principles.

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