

Full Length Research Paper

An analysis of the impact of disruptive technology on the success of small and medium enterprises (SMEs) in a developing nation. A case of King Williams Town, South Africa

Dominic. B. Chishakwe* and Wilhelmina Smith

Department of Business Management, University of Fort Hare, Alice, South Africa.

Accepted 14 June, 2012

Small and medium enterprises (SMEs), especially in developing nations, offer access to employment to the low income, semi-skilled and even non-skilled individuals. However, it is ascertained that lack of access to appropriate (up-to-date) technology is amongst the major challenges faced by small and medium enterprises (SMEs) in developing nations. The aim of this research is to analyse disruptive technology and its impact on the success of SMEs in a developing nation. The research will also show how beneficial disruptive technology is to businesses. The data for the research study was collected through a survey type structured questionnaire that was carefully developed and validated through pre-testing. The questionnaire was administered to both owners and managers of SMEs in King Williams Town. The primary objective of the study was to analyse whether disruptive technology has got an impact on the success of SMEs and the results showed that disruptive technology alters the way businesses operate and it can therefore be concluded that disruptive technology has an impact on the success of SMEs.

Key words: small and medium enterprises (SMEs), impact, disruptive technology, success.

INTRODUCTION

In general, disruptive technology challenges and changes or transforms the existing ways or methods of doing things. The idea relating to the improvement or development of technology clearly illustrates that management is challenged every time a new type of technology is launched. Technology has thus improved and continues to improve the way we live, do business, communicate and interact socially. Technology is undergoing massive and rapid change. According to Rayport and Jaworski (2004) new and improved technological innovations emerge almost daily.

The lack of access to appropriate technology alternative termed, disruptive technology, is amongst the major challenges faced by Small and Medium Enterprises

(SMEs) in South Africa. Disruptive technology can be defined as new ways of doing things that disrupt or overturn the traditional methods and practices of conducting business. The development of the Internet which overtook the traditional post office mail services serves as an example. Resultantly, all business entities have to adapt to the making use of such new technology to maintain their competitive advantage in the ever dynamic business environment.

The need to provide better quality products within the minimum possible time and at the least possible cost, has led to an increased usage in the world to find new efficient technologies to support the cost sequence of any organisation. Many firms have come into contact with the importance of technology and its impact on both service quality and success of the business as a whole.

The importance of technological innovations is continuously increasing, and technology is becoming extremely vital to the success of different business

*Corresponding author. E-mail: 200808328@ufh.ac.za. Tel: 071 991 6690.

entities (Windell, 2007: 1). Technology assists an organisation in maintaining its competitive frame in the marketplace. The impact of disruptive technology can be broadly discussed in terms of business value for information technology, business processes and standards, approaches to business strategy and influence of customers and clients of an organisation (Windell, 2007: 2). However, whenever new technology is introduced into the marketplace, the potential for it to change the business setting is increased.

In the business world, technology is ever dynamic and firms are exposed to intense pressure to stay abreast with innovative technology and at the same time maintaining their competitive advantage. Technology has become central to business and society and the success of a firm has become increasingly dependent on how the firm will be transformed by disruptive technology (Dhar and Sundararajan, 2007: 126).

From a business point of view, it is constantly becoming important to notice that innovative technologies provide enough information in relation to the benefits that technology offers for firms in terms of increased productivity, performance delivery and value addition to the business and the business society.

This research focused on the continuous development of technology and its possible effects on the operations of SMEs in developing nations such as in King Williams Town, South Africa. The research basically focused on the relationship between disruptive technology and the success of SMEs and also investigated whether owners or managers of SMEs were aware of disruptive technology, and the potential benefits of utilising such technological innovations.

Statement of the problem

Technology plays a significant role in business operations and it supports the core business of an organisation. Technology can potentially provide a competitive advantage to SMEs if they adapt to changes in technology or risk losing business if they are reluctant to use new technology. It is usually difficult to determine whether disruptive technology impacts business operations or not.

On the other hand, it has been noted that technology advancement is providing a major setback to many SMEs in the world as a whole. This is because of lack of capital and other resources to keep abreast with such new innovations. This is indicated by the rate of failure of SMEs in the early stages of business operations, proposed to be within two years from start-up (Nieman and Nieuwenhuizen, 2009: 35).

Objectives of the study

The following were the aims of this study:

1. To analyse whether disruptive technology has got an impact on the success of SMEs in King Williams Town.
2. To examine whether lack of access to capital affected SMEs' adaptation of new technologies.
3. To investigate whether owners / managers of SMEs were aware of disruptive technology, and the potential benefits of utilising such technological innovations.
4. To ascertain the potential benefits of using disruptive technologies.

Significance of the study

This research focused on the continuous development of technology and its possible effects on the operations of SMEs in King Williams Town. The research basically focused on the relationship between disruptive technology and the success of SMEs and also investigated whether SME owners or managers are aware of such technologies. Furthermore, the paper also aims to identify the potential benefits of utilising recent or up-to-date technological innovations. The research attempted to give an insight into the need for SMEs to continuously adapt to new, innovative technology which will help them maintain their competitiveness in the business sector.

This study also aimed at gathering information on how disruptive technology impacts SMEs and how these firms can effectively increase the value of information technology which impacts both operational and the organizational excellency of the business (Dhar and Sundararajan, 2007: 126). The intention of this research was to equip SMEs with some degree of knowledge of the degree of innovative technology and its impact on business operations.

LITERATURE REVIEW

In South Africa, the National Small Business Act of 1996, defines small businesses as a separate distinct business entity that is managed by one owner or more people and which can be classified as a micro, very small, a small or medium enterprise by satisfying the criteria. These include cooperative enterprises and non-governmental organisations, as well as branches or subsidiaries, if any (Rwigema and Venter, 2004: 314).

Different definitions of disruptive technology can be found in literature. According to Daneels (2004: 247), disruptive technology is a specific type of technological change which operates through a specific mechanism and has specific consequences. Daneels investigated this concept to establish when technology may be deemed disruptive or if disruptiveness is implied when new technology is implemented (Windell, 2007: 10). This means that disruptive technology alters competition levels between firms by changing the level of performance and business processes.

Maintaining the competitive advantage of a firm is always essential to its success. This competitive advantage is connected to the level of technology used in the firm's processes and procedures (Cornford and Smithson, 2003: 77). A quality level of service delivery to customers will require the firm to adapt to changing technology which helps improve both the quality and reliability of the firm's products and services (Lasry and Callahan, 2004: 58). Speed and efficiency which is also a factor of technology are also other key components that aid to maintain competitive advantage.

Competitiveness is the reason why one firm can do better than other firms. Most firms find it difficult to defend their operations against competition. A firm will need to establish a strong technological base for operational efficiency in the firm which in turn will improve the quality and reduce costs of the firm as a whole (Rayport and Jaworski, 2004: 117). Close interactions and relationships are essential between the technological department and other functions of the business, namely: operational, finance, marketing and other departments. Innovation into new and more advanced ways of doing business is the key to remaining competitive and ahead of competition (Kotler and Keller, 2006: 92).

Disruptive technology is beneficial to businesses as it helps improve productive capacity, support business processes and help in value addition. Businesses should be aware that disruptive technology is central and provides a mediating role which supports interaction between firms, consumers and customers (Dhar and Sundararajan, 2007: 125). Therefore, it is of great importance to take into consideration the value of innovative technology to determine whether its impact will help firms to reshape their processes in order to achieve their goals.

THE DISRUPTIVE TECHNOLOGY (CLAYTON CHRISTENSEN)

The disruptive technology model from Clayton Christensen is a theory that can be best used to discuss the impact of new and ground breaking technologies on a firms' existence. This model was introduced by Christensen in 1997 in his book "The Innovators Dilemma: When New Technologies Cause Great Firms to Fail." This model was a function of performance and time in relation to new technology. This model also describes the inability of great firms to counter-act the impact of new technology and is illustrated in Appendix 1.

Christensen argues that due to the unpredictable nature of disruptive technology, successful and well managed firms can also be negatively affected. In his theory, Christensen distinguished between sustainable technologies and disruptive technologies in which sustainable technologies add value to existing and already established products whilst disruptive technologies

disrupt or redefine performance levels thereby creating a new marketplace (Anthony, 2004: 38).

The distinction between sustainable innovations and disruptive innovations is indicated by the two arrows in Appendix 1, which are parallel and indicate the change in performance of business firms with time after the introduction of new technologies (disruptive technologies).

In general, technological improvements result in performance improvement of established products. These products usually become faster, cheaper, louder, and smaller, as indicated by the above characteristics of disruptive technology (Christensen, 1996: 26). These new innovations will be simpler and opportune to customers because they remain in line with their current needs end expectations. Christensen regards these kinds of developments as "sustaining in character". Great firms direct the industry to embrace these innovations and exploit potential benefits of these technologies.

As competition increase in industries, firms try to upgrade their performance levels by attempting to produce better products in order to attain customers in the market. The improvements in performance will however, increase at a faster rate than anticipated customer needs, a situation which will give rise to disruptive technologies. In the model by Christensen, the x-axis represents time, the y-axis represents the product performance and the z-axis represents consumer segments. The two dimensions, time and performance define a particular product in a market. The third dimension or z-axis represents satisfied customers whose needs are being met by the increased uses of the products. The more the performance of a product increases, the more the needs of customers are being met and eventually customer's expectations are surpassed. This situation will leave a gap of unmet needs which requires simpler and convenient product offerings.

Christensen's model critique

After explaining the disruptive technology model by Christensen, the potential benefits and drawbacks of this model become clear. The following advantages are some of the advantages of Christensen's model:

1. This model provides useful insight to business associates and managers on the impact of disruptive technologies and why many firms fail when confronted by such technologies. Failure can be defined as the inability to achieve set goals. This is a cause of many factors but in the case of this study, failure is anticipated by the inability of firms to utilise disruptive technologies.
2. The model is also useful to managers as it helps them to determine when an idea or technology may become disruptive or not. It also provides guiding principles to new firms to commercialise disruptive technologies.

3. As explained by Anthony (2004: 39), this model makes managers aware of the potential of their firm. In this respect, due to an increase in business competition, in recent years many firms have and are trying to improve their market position, business performance and competitive advantage by developing new capabilities within their businesses through accumulating new resources, for example investing in new technologies, hiring new expertise, adopting new production lines and product diversification.

However, without the realisation of new business trends, the above mentioned will not lead to business success even when managed properly. Managers, therefore need to change the processes and values of the current firm and develop within the new construct, and adapt new processes designed to solve the new problem. The following are some of the disadvantages of Christensen's model:

1. It is difficult to use this model to assess whether an idea or technology is disruptive for all firms or whether it represents sustaining innovations to other firms.
2. The assumption that new technologies will always lead to the improvement of existing products as indicated by the upward sustaining technology arrow in Appendix 1, is not always the case because as times goes by, other new technologies are discovered, leading to the collapse of the sustaining innovations. Furthermore, with time, customers will slowly adopt new technologies which could however, reduce the gap between sustaining innovations and disruptive innovation.
3. Many theorists also argue that Christensen has selectively chosen case examples to support his framework (Cohan, 2000: 68). In Christensen's framework, all disruptive technologies developed into major market force. However, according to Finkelstein and Sanford (2000: 43), there are many disruptive technologies that fail to materialise, for example the Iridium Global Satellite Phone System.

RESEARCH METHODOLOGY AND DESIGN

Research methodology explains the manner and way in which data is to be collected. The research design refers to the outline plan or strategy specifying the procedure to be used in seeking an answer to the research question. Basically there are two types of data collection methods, which are the qualitative and quantitative research methods. Quantitative research uses mathematical models, theories and hypotheses pertaining to natural phenomenon. Qualitative research incorporates various interpretive techniques that try to find the meaning, not frequency, of occurring phenomena in the societal world.

This research study employed quantitative research techniques and self-administered questionnaires were designed for the purpose of collecting information from SME owners/managers. From the total population of respondents, information collected was analysed to determine the relationship between disruptive technology and the success of SMEs. The questionnaire consisted of open-ended questions, closed-ended questions and a number of

Likert scale questions. It is recognised that a self-administered questionnaire could reduce bias and save both time and money.

The population of the research measures the total number of subjects that are incorporated in a study. In this research, population refers to the total number of SMEs that operate in King Williams Town. This study area was chosen due to its diverse business activities and also the fact that it has a relatively large number of SMEs. These SMEs include both firms in the manufacturing, retailing and service industry.

The population is the entire group of individuals that the researcher wants information about. The sample is the part of the population that the researcher actually examines in order to gather information. Drawing a sample representative of the actual population reduces the difficulties and costs involved in carrying out the research from the whole population (Cooper and Schindler, 2003: 82).

A simple random sampling method was adapted by the researcher. This method is a probability sampling method which entails that every single SME had an equal chance of being selected into participation in the research. A total of 109 respondents were used as the sample. The sample was small enough to allow feasibility of the research, yet large enough to be a true representative of the total population. In calculating the sample size the researcher used a 95% confidence interval, a response distribution of 50% and the margin of error of 5%. The sample size was calculated using the sample size calculator formulae as follows:

$$N \geq N/1 + Nd^2/10000$$

Where: n=sample size, N=total population, d=error estimate with a confidence interval of 95%.

For the purpose of this research, the population was 260 (Buffalo City Municipality) and using a margin of error of 5% (which is usually used in business), a confidence level of 95% and a response distribution of 50% gives a sample size of 109 (Raosoft, 2007: 1). The population frame used was obtained from small enterprise development agency (SEDA). Since the list comprised of all SMEs operating in the Buffalo City Municipality, the authors had to compile the list of only those that operates in King Williams Town as it was the study area. This was done through looking at the addresses of the SMEs.

The validity and reliability of the questionnaires used to collect data was measured statistically, using a number of statistical tests. To measure this, a Chi-square test and Cronbachs alpha was used to calculate approximate p-values. The Chi-square test was used to test whether a sample of data came from a population with a specific distribution. In other words, it was used to examine the strength of the association between collected data and the specified distribution and it was then ascertained that the questionnaire was deemed valid and reliable.

Data analysis is a practice in which raw data is regimented and organised so that useful information can be extracted from it (Smith, 2011). This analysis comprised five steps including validation, coding, data transcribing, data entry and data cleaning. Coding may be defined as assigning the segments of data, with symbols, descriptive words or names. For the purposes of this research, numbers were used. The Chi-square test for independence was done as a statistical method of analysing data. The research also used non-parametric statistical tests. The data analysis was done with the assistance of the statistics department of the University of Fort Hare.

Business success measures

To investigate the impact of disruptive technology on the success of SMEs, an analysis of common measures or indicators of business

success was carried out. A check of profitability in preceding years relative to the adaptation of disruptive technologies was computed. This measure helps to directly assess how the introduction or adaptation of disruptive technology affects the profitability of SMEs. Profitability is also a measure of cost and efficiency levels of a firm. This also means that a reduction in costs and improvements in efficiency levels are also measures of business success and all these were looked into. A Likert scale was used to collect data from SMEs specifically on the issue of profitability.

RESULTS AND DISCUSSION

Population characteristics

To analyse the impact of disruptive technology on the success of SMEs in King Williams Town, the researcher used a sample of 109 to collect the data. Out of 109 respondents, 22 respondents did not respond to all the questions that were issued to them. This means that the response rate was about 80%, which is fair enough for a research study. The target respondents were the owners or managers of SMEs in King Williams Town.

Of the respondents, 22% were owners, 10% were managers and 68% were both the owner and manager of the business. From the responses, 73% of respondents were male and 27% were female. Results indicated that the majority of respondents were retail traders (buyers and sellers), which represented 48% of the total sample, followed by the service industry with about 29% of respondents dealing in this type of industry. The manufacturing sector was third and represented 18% of the total sample, showing that the retail businesses make up the majority of SMEs in King Williams Town.

The majority of SMEs have been in existence for between 6 to 10 years and they represent about 55.2% of the total responses. This was followed by those that have been in existence for up to 5 years and this account for 21.8% of the total responses. Those SMEs with over 16 years in business accounted only for 8% of the total responses and were fourth after those which have been in existence between 11 to 15 years. The results in the foregoing imply that most of the SMEs are in the late growth and maturity stages of their business cycles.

Technology versus profitability

This question sought to clarify the primary aim or objective of the study. Respondents were asked to indicate their level of agreement to the notion that disruptive technology has got an impact on the profitability of businesses. The responses to the question are represented in Table 1.

As shown in Table 1, the majority of respondents (75.9%) supported the statement that disruptive technology has got an impact on the profitability levels of their businesses as it is also reflected in their financial statements in preceding years after the adaptation of

such technologies. Only one (20.7%) disagreed to the statement and about 3.4% were neutral to the assertion. This result proves that disruptive technology plays a significant role on the success of SMEs and appears to be beneficial to business success.

Technology awareness

The majority of the respondents indicated that they are aware of up-to-date technologies that they can use in their businesses. This accounted for about 72.4% of the total respondents, whilst 27.6% of the respondents were not aware of such technologies. This result indicates that technology is widespread and many people are aware of recent technologies that could be used in their businesses. This helped the researcher to obtain information on the respondent's awareness of technology that can be used in business operations. To add on, this question was also important as it helped the researcher to determine whether SME owners do actually have knowledge of up-to-date technologies that are used in the modern business environment. The results to this question is also in line with earlier findings of Windell (2007) which stated that most firms are aware of new technology that can be utilised to gain and improve a firms competitiveness in the market.

Examples of technologies

This question was very essential as it shed light on the research about the real examples of technologies that are being widely used and have become disruptive to businesses. Several examples were given by respondents and this varied from one business sector to another. The responses to this question are explained in Table 2.

As illustrated by Table 2, 54 respondents indicated that the Internet is one of the technologies that they are aware of and are making use of. It is widely recognised that the Internet plays a vital role in business operations in the modern world and many business owners are now making use of the Internet instead of using traditional methods. Responses also showed that most of the respondents, who indicated the Internet as an example of disruptive technology, are from both the service and retail sectors. This means that many business owners are now using the Internet to advertise, search and place orders for their products and service offerings.

The results shown in Table 2 also indicates that 16 respondents pointed out that hair saloon equipment which included all saloon accessories is also another example of technologies that they are aware of. These examples were obtained from respondents in the service industry with saloons as their business entities. Examples of saloon accessories highlighted include electronic dryers, pedicure and manicure sets, and electronic

Table 1. Capital as a factor influencing SME accessibility to up-to-date technology.

	Frequency	Percent	Valid percent	Cumulative percent
Valid	1	43	49.4	49.4
	2	23	26.4	75.9
	3	3	3.4	79.3
	4	14	16.1	95.4
	5	4	4.6	100.0
Total	87	100.0	100.0	

Table 2. Examples of technologies.

Example of Technology	Number of respondents
Barcode reader	31
Internet	54
Saloon equipment	16
Electronic billboards	33
SMS/emails	44

toners.

To add on, the results also indicated that SMS/Emails are also some of the new technologies that are being widely used in the business environment. About 44 respondents supported this notion as they pointed out that SMS/Email facilities through the use of the Internet are also examples of recent technologies.

Benefits of technology

This question was intended to test the respondents' level of agreement to the notion that many benefits arise from making use of recent or up-to-date technologies. The results from respondents indicated that the majority of respondents (85%) supported the statement that utilising up-to-date technology in their business gives many benefits, and only 5.8% disagreed to the statement and 9.2% were indifferent to the assertion. This result proves that up-to-date technology plays a significant role in the success of SMEs and appears to be beneficial to business success.

Other benefits of using recent technology

Respondents were asked to name some of the benefits derived from utilising up-to-date technologies. The responses to this question were categorised into three broad categories namely:

1. Cost: From the first category given previously, 36.9% of the respondents highlighted that utilising recent

technologies is cheap and reduces the overall costs of their businesses, which in turn increases their profitability. This is also supported by earlier work of Christensen which states that disruptive technologies are typically cheaper and more convenient to use.

2. Efficiency: In the second category, 41.3% of the respondents indicated that using recent technology is fast and efficient; and

3. Quality: Only 21.8% of the respondents reinforced this notion and indicated that the use of recent technology also reduces the number of defect products.

This result shows that the use of recent or up-to-date technology is efficient and helps improve the quality of products and services at the least cost possible, aiding to the profitability and success of SMEs.

Accessibility to up-to-date technology

This question was intended to ask respondents about the factors that influences their accessibility to up-to-date technology. The results of this question are illustrated by the Table 3, the two factors being capital illustrated in Table 3 and the second in education and training, which appears in Table 4.

The results to the statement "capital as a factor influencing SME accessibility to up-to-date technology" shows that the majority of respondents (55.1%) did not agree to the assertion that capital influences their accessibility to up-to-date technology, 37.9% agreed to the statement and 6.9% of the respondents were indifferent to the statement. This result shows that capital

Table 3. Capital as a factor influencing SME accessibility to up-to-date technology.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Strongly disagree	17	19.5	19.5	19.5
	Disagree	31	35.6	35.6	55.2
	Neutral	6	6.9	6.9	62.1
	Agree	19	21.8	21.8	83.9
	Strongly agree	14	16.2	16.2	100.0
	Total	87	100.0	100.0	

Table 4. Education and Training as a factor that influence SME accessibility to up-to-date technology.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Strongly disagreed	10	11.5	11.5	11.5
	Disagreed	12	13.8	13.8	25.3
	Neutral	7	8.0	8.0	33.3
	Agreed	27	31.0	31.0	64.4
	Strongly agreed	31	35.7	35.7	100.0
	Total	87	100.0	100.0	

does not influence SME access to up-to-date technology. This could be because the majority of these SMEs have been in business for more than 5 years and hence they should have a substantial capital base accumulated over their business life.

The second factor asked was whether education and training influences SME accessibility to up-to-date technology and the responses to this question are illustrated in Table 4. When asked to ascertain whether education and training influences SME accessibility to up-to-date technology, the majority of the respondents (66.1%) agreed to the assertion that Education and Training does influence their accessibility to up-to-date technology, 25.3% of the respondents did not support this statement and highlighted that Education and Training does not influence their accessibility to up-to-date technology. Only 8.0% of the respondents were indifferent to the statement. The results show that accessing up-to-date technology is somewhat complex and needs an educated person to access it.

The third factor asked was whether government intervention influences SMEs accessibility to up-to-date technology and the majority of the respondents (71%) agreed to the assertion that Government Intervention does influence their accessibility to up-to-date technology, 29% of the respondents did not support this statement and highlighted that Government Intervention does not influence their accessibility to up-to-date technology. The results show that government intervention definitely plays a role in SMEs access to up-to-date technology. Furthermore, 52.8% of the respondents did agree to the assertion that cost of

technology influences their accessibility to up-to-date technology, 40.2% did not agree to the statement and 6.9% of the respondents were indifferent to the statement. This result shows that the cost of up-to-date technology hinders SMEs from using these technologies.

Testing of hypotheses

Hypothesis testing refers to the use of statistics to determine the probability that a given hypothesis is true. The questions in the above section were developed to answer the hypothesis theory. The hypotheses tested are:

H₁: Disruptive technology has an impact on the success of SMEs in King Williams Town.

H₂: Lack of access to capital affects SMEs' adaptation to new technologies.

H₃: Owners / managers of SMEs are aware of the use of disruptive technology and the potential benefits of using such technological innovations.

H₄: There are benefits of using disruptive technologies.

In the subsequently, each hypothesis is tested on its own to ascertain acceptance or rejection thereof.

Hypothesis one

This hypothesis was aimed to test the link between disruptive technologies on the success of SMEs in King

Table 5. Chi-Square test for association between disruptive technology and success of SMEs.

Test statistics	Value	Degrees of freedom	Asymp. Sig. (2-sided)
Pearson chi-Square	1.868 ^a	4	0.030
Likelihood ratio	1.719	4	0.787
Linear-by-linear association	0.120	1	0.729
N of valid cases	87		

Table 6. Chi-Square test for association between SMEs access to capital an access to up-to-date technology.

Test statistics	Value	Degrees of freedom	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.828 ^a	3	0.0619
Likelihood Ratio	2.873	3	0.412
Linear-by-Linear Association	2.605	1	0.107
No of Valid Cases	87		

Williams Town. A chi-square test was used to test the association between technology and success. Using the chi-square test the hypothesis can be restructured to:

H₀: There is no association between disruptive technology and success of SMEs.

H₁: There is an association between disruptive technology and success of SMEs.

A cross-tabulation was performed to assess the impact of technology on the success of SMEs in the area. The cross tabulation was done at a significance level of 5%, and revealed a statistically significant association between the two variables ($\chi^2=1.868$, $p=0.30<0.05$). This means that disruptive technology plays an important role in business and has a definite impact on business success. Then a chi-square test was done to test for association between these two variables, the results are shown in Table 5.

Table 5 above shows the results of the Chi-Square test and indicates that the pearson Chi-square was 0.30, with four degrees of freedom, the likelihood ratio was 0.787 with a linear-by-linear association of 0.688. Since the p-value is less than 0.05, it therefore means that the null hypothesis is rejected. This therefore means that there is an association between disruptive technology and SME success. This means that disruptive technology has got an impact on the success of SMEs.

Hypothesis two

Hypothesis two was aimed to test whether lack of access to capital affect SMEs adaptation for new technologies. A Chi-square test was done to test for association between capital and access to up-to-date technology. A Chi-

square test at a significance level of 5% showed a statistically significant association between these two variables ($\chi^2=2.828$, $p= 0.19 < 0.05$). The results of this test are illustrated in Table 6.

Table 6 shows the results of the Chi-Square and indicates that the pearson Chi-square was 0.0619, 3 degrees of freedom, the likelihood ratio was 0.412 with a linear-by-linear association of 0.107. Since the p-value of the test is 0.0619 which is less than 0.05, it therefore means that we fail to reject the null hypothesis and conclude that there is no association between SMEs access to capital and accessibility to up-to-date technology. This means that capital is not one of the factors that influence SMEs adaptability to recent technology. This is also supported by responses in Table 3.

Hypothesis three

Hypothesis three tested whether Owners / managers of SMEs are aware of the use of disruptive technology and the potential benefits of utilising such technological innovations. A Chi-square test was carried out at a significance level of 5%. The test showed statistically significant association between these two variables ($\chi^2=6.621$, $p= 0.28 < 0.05$). The results shows a Chi-square value of 6.621 and five degrees of freedom with a p value of 0.28. Since the p value is 0.028 and less than 0.05, the null hypothesis is rejected and it is concluded that SME owners are aware of the use of disruptive technologies and the potential benefits of utilising such technology. This is also supported by responses shown on page 12 in which respondents highlighted the benefits and advantages of using modern or up-to-date technology amongst which includes that:

Table 7. Frequencies shown by non-parametric test on the benefits of using disruptive technology.

Benefits	Observed number	Expected number	Residual
Cheap	43	21.8	21.3
Fast	31	21.8	9.3
Efficient	8	21.8	-13.8
Quality improvement	5	21.8	-16.8
Total	87		

Table 8. Chi-Square test of the benefits of technology.

Test statistics	Benefits of technology
Chi-Square	46.287 ^a
Degrees of freedom	3
Asymp. Sig.	0.036

1. It is fast and cheap to use modern technology;
2. It is more efficient to use such technology; and
3. The use of modern technology leads to an improvement in the quality of products and services and a reduction in product defects.

Hypothesis four

Hypothesis four tested there are benefits of using disruptive technologies or not. To analyse this hypothesis, a non-parametric chi-square was carried-out. Non-parametric chi-Square tests measures the distribution of the responses that is the proportion between or among responses. This test is carried-out when responses or options on a particular question are more than two and tests the equality of the distribution of responses. This test was done through measuring the frequencies of observed values attaching the residual values. A chi-Square statistical test was then done after carrying out the non-parametric test. The results of the Non-Parametric test are illustrated on Table 7.

Responses to question 10 show that that the majority of the respondents indicated that one of the benefits of using disruptive technology is that it is cheap. The observed number (N) of this assertion was 43 with a residual value of 21.4 as shown in Table 6. A lesser number, 31 respondents also highlighted that using modern technology is fast and those who agreed to this notion were 31 with a residual value of 9.3. However, only 5 respondents in the manufacturing sector indicated that using up-to-date technology leads to quality improvement and had a residual value of -16.8. Table 7 shows the result of the Chi-square that was carried out after the non-parametric test.

As shown in Table 8, the Chi-square value is 46.287 and there degrees of freedom with a p value of 0.36.

Since the p value is 0.036 and less than 0.05, the null hypothesis is rejected and it is concluded that there are benefits of using disruptive technologies. This means that there are more benefits than disadvantages of using disruptive technologies.

Suggestions on SMEs adaptability to technology

This question was mainly addressed to respondents to provide their suggestions on what should be done to help SMEs to adapt to up-to-date technology. The few suggestions provided include the following:

1. Education and training;
2. Government intervention; and
3. Technology awareness campaigns and workshops.

The results of this study concluded that a relationship between disruptive technology and business success could be found. However, the results of this study showed that disruptive technology positively affects business operations, a notion which is in line with earlier scholarly work.

Questionnaire validity and reliability

The Cronbach's alpha statistical method was used to measure the validity and reliability of the questionnaires used to collect data. The results of the test are shown in Table 9. The table shows the results of the Cronbach's statistical test for the validity and reliability of the questionnaire that was used. Since the alpha value is 0.827 which is more than 0.7, it is concluded that the questionnaire used was valid and reliable.

Table 9. Reliability statistics.

Cronbach's alpha	Number of items
0.827	50

Conclusions

The overall purpose of the research has been to understand the association between disruptive technology and small business success in a developing nation with King Williams Town, South Africa as the case area. It is anticipated that the study will shed light on real examples of technologies that are widely used in the business world and to ascertain the potential benefits of using such technologies.

The research used the quantitative method of data collection with a self-administered questionnaire as its research instrument. The study confirmed that disruptive technology has got an impact on small business success and that SME owners are aware of both these technologies and the benefits of utilising such technologies. This is in line with most existing studies.

The study also confirmed that education and training, cost of up-to-date technology and government intervention are the main factors that influence SME adaptation to recent or up-to-date technology.

RECOMMENDATION

From the results of the research, numerous suggestions can be made to SMEs and other businesses at large about the importance and drawbacks of disruptive technology. These suggestions, if adopted by business entities, should improve on the overall efficiency of the businesses, thereby it could be possible to drive them to profitability.

The research results showed that most of the SME owners or managers in developing nations are aware about up-to-date technologies they can use and their potential benefits. However, there are other SMEs that are not aware of such technologies and therefore the following serve as recommendations:

1. To achieve economic development, the government should intervene and set up more support programmes in the form of technology awareness campaigns which will focus mainly on highlighting up-to-date technologies that business entities can use to improve productivity and business efficiencies;
2. SMEs must also form joint programmes in which they hold technology seminars and workshops which will help them to address key problems that they will be encountering in their day to day operations. This will help them understand the nature and extent of disruptive technologies, unlike sharing information with another

parties not directly involved in the business operations like the government; and

3. Institutional support to SMEs, should speedily establish technology training centres in both rural and urban areas and these institutions should be targeted to teach and train owners/managers of SMEs on the use of recent technologies.

On another note, the findings of this study showed that SMEs are failing to adapt to the use of up-to-date technology, due to the high costs of these technologies, therefore:

1. The government should strive to put in place some form of technology subsidy programmes for SMEs. This will help SMEs to import and buy up-to-date technology at reasonable prices which they can afford; and
2. More funding should be made available to those SMEs who will be interested in expanding their technology bases to take advantage of economies of scale and command of technologies.

All in all, the study recommends that the government must support SMEs to adapt to recent technologies as they are seen as the engines of many world economies and are known to help increase employment creation, which then leads to poverty alleviation.

LIMITATIONS OF THE STUDY

The fact that the research study was carried out in King Williams Town, is the main shortcoming of the research, as the results cannot be generalised to the whole country and the world at large. This is because the research is not externally valid as King Williams Town is not representative of developing nations. Furthermore, the respondents who answered the questionnaires did not offer support and it was not economic in terms of transport costs to and from one respondent to the other as they are spaced. Another limitation of this study is the problem of unanswered questions.

REFERENCES

- Anthony SD (2004). *A diagnostic for Disruptive Innovation*. Boston. Harvard Business School Press.
- Christensen CM, Bower JL (1996). Customer Power, Strategic Investment, and the Failure of Leading Firms. *Strateg. Manag. J.* 17(3):197-218.
- Cohan PS (2000). The Dilemma of the "Innovator's Dilemma": Clayton Christensen's Management Theories Are Suddenly All the Rage, but Are They Ripe for Disruption? *Industry Standard*, January 10, 2000.
- Cooper DR, Schindler PS (2003). *Business Research Methods*. 9th Edition. McGraw-Hill, New York, USA.
- Cornford T, Smithson S (2003). *Project research in information systems. A student's guide*. MacMillan, London.
- Daneels E (2004). Disruptive technology reconsidered. A critique and research agenda. *J. Prod. Innov. Manag.* 21(4):246-256.
- Dhar V, Sundararajan A (2007). Information technologies in business. A blueprint for education and research. *Inf. Syst. Res.* 18(2):125-141.

- Finkelstein S, Sanford SH (2000). Learning from Corporate Mistakes. The Rise and Fall of Iridium. *Organiz. Dyn.* 29(2):138-148.
- Kotler P, Keller KL (2006). *Marketing Management* 12th Edition. Pearson Publishing, New Jersey, USA.
- Lasry E, Callahan JR (2004). Customer-led or successful? The implication of end user involvement in the development of really new products. *Technology and Innovation Management*, Conference paper, pp. 1-33.
- National Small Business Act (1996). *Juta's Statutes of South Africa*.
- Nieman G, Nieuwenhuizen C (2009). *Entrepreneurship South African Perspective*. 2nd Edition. Van Schaik Publishers, Pretoria.
- Rayport JF, Jaworski BJ (2004). *Introduction to e-commerce*. 2nd Edition. McGraw-Hill, New York, USA.
- Rwigema H, Venter R (2004). *Advanced Entrepreneurship*. Oxford University Press, CapeTown.
- Smith SE (2011). What is Data Analysis [On-Line]. Available: <http://www.wisegeek.com/what-is-data-analysis.htm> [Accessed: 20 June 2011]
- Windell AC (2007). A case study research, The impact of Disruptive technologies on designated organizations within the IT industry in South Africa. Unpublished M Com Thesis. Pretoria, University of Pretoria.