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*Full Length Research Paper*

# Has technological innovations resulted in increased efficiency and cost savings for banks' customers?

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**The role of technological innovations on efficiency and cost reductions in the banking sector is paramount to the successful and profitable service delivery in the sector. Technological innovations play a significant role in improving the efficiency of the banking sector as well as reducing the costs of banking transactions for customers. The banking sector has, for the past decade, witnessed various improvements and new technologies with the main purpose of improving the service delivery of the banking sector. The research objective was to determine the role played by technological innovations in improving efficiency in banks and reducing costs for customers. A quantitative research method was followed and the data was analysed using chi-square tests. The research at hand obtained a data set to examine the contentions that technological innovations are benefiting customers in Alice, South Africa, in terms of improved efficiency and reducing costs for the banking sector customers. The findings of this study support this contention and had proved that technological advances played a significant role in improving the welfare of customers.**

**Key words:** Technological innovations, banking sector, efficiency, cost reduction.

## INTRODUCTION

Technological innovations (advances in technology such as the invention of ATMs, cell phones and computers) have had a profound impact on the banking sector and the wider financial sector over the last decade in South Africa. Bankley et al. (2006:283) define technology as the way of doing things better. As such, technologically excellent organisations continuously strive to identify better processes and systems management techniques to ensure that they are market leaders. Of particular note is the rapid advancement in the Information and Communication Technology (ICT) which has become instrumental in the development of banks' business stra-tegies, customer services and organizational structures, among other related functions (Bankley et al., 2006:283).

In the financial services industry at large, the banking sector was one of the first to embrace rapid globalisation and benefit significantly from Information Technology (IT) developments. Technological developments in the bank-ing sector started in the 1950s with the installation of the first automated bookkeeping machine at banks. Automation in the banking sector became widespread over the next few decades as bankers quickly realized that much of the labour intensive information handling processes could be automated with the use of computers. The first Automated Tellers Machine (ATM) is reported to have been introduced in the USA in 1968 and it was only a cash dispenser (Jayamaha, 2008:1).

The advent of ATMs played a significant role in improving customer convenience and reducing costs and this led to improved efficiency (output per unit input; also see section 1.6 page 6 for clarification) and profitability in services delivery of the banks. Prior to the advent of ATMs, funds withdrawals, accounts enquiries and funds transfers between accounts required face to face interactions between bank staff and customers, a process which was slow and subject to costly human errors and large costs of labour. IT developments have enabled banks to gradually replace manual work with automated processes.

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Technological progress has brought in the speedy processing and transmission of information, easy marketing of banking products, enhancement of customer access and awareness, wider banking networking and regional and global links on an unprecedented scale (Jayamaha, 2008:1). IT developments thus played a role in changing the product range, product development, service channels and type of banking services as well as the packaging of such services with significant efficiencies not only in the banks, but also in the ancillary services to banks.

Of notable importance in the banking sector is the growth of internet banking, a development that came as a result of technological innovations. Internet banking provides an extensive, low cost and convenient financial network that facilitates banking services to customers anywhere and anytime. The internet resulted in improved telecommunication networks which enabled banking transactions to be done on-line. Also, a result of the internet is the integration of e-trading with internet banking and banks' websites, a development necessary for marketing of the banking products. The internet has made it possible to establish low cost financial networking. (Porteous and Hazelhurst, 2004:32).

Despite the noted roles played by technology advancements in the banking sector, it remains a question of controversy as to whether the efficiency of the banking services providers in South Africa has improved and if so, to what extent and whether customers are happy with such developments. The controversy exists as a result of the fact that technological developments come with costs attached to them and environmental and social effects to the society at large. Information technology is simply a necessary evil, something that every company has to have in order to keep basic activities running efficiently. However, technology has taken every activity in daily operations, in most firms, to such an extent that any breakdown in technology will have unimaginable consequences. For example, a breakdown of an ATM, for say an hour, may result in huge costs to the firm in terms of lost transactions (Austin, 2007:2).

The impact of technological innovations on production and profitability also attracted several researches. In their research, Blankley et al. (2006:104) ask firms to subjectively answer a question on whether innovative activities had either a positive or negative impact on a range of production activities and the overall profitability. The results showed that 38% of firms indicated that the innovative activities had a positive impact on profitability at the firm level and only 7% reported a negative impact.
Since the ultimate objective of every profit making venture is to increase the profitability and wealth creation, it becomes an area of interest to find out whether the use of technological advances in banks are contributing towards increasing profitability. A contentious question is also whether these technological innovations result in cost savings for customers.

To this effect, the research at hand investigated the role played by technological developments on the efficiency and cost aspects relating to banks' customers in Alice, with special reference to Standard Bank and FNB. Standard Bank and FNB are the two major banks, which have branches in Alice town.

The section that follows states the problem that the research at hand seeks to provide answers to.

## Statement of the problem

Technological advances come with several costs and effects to the society and bankers, while efficiency is aimed at maximising output and eventually profitability, with a given set of resources. The aim of the study is to provide answers to questions such as whether technological innovations have improved efficiency and reduced costs relating to customers of the banking sector.

To address this problem the following section outlines the researchers' objectives.

## Research objectives

The research seeks to explore the following objectives:

### *Primary objective*

To determine the impact of technological innovations on the banking sector's efficiency as well as costs relating to its customers.

## Research hypothesis

In pursuit of the above mentioned objective, the following hypotheses have been formulated:

### *Primary hypothesis*

**$H_o$**-Technological innovations have not improved efficiency in the banking sector in the town of Alice, South Africa.
$H_1$-Technological innovations have improved efficiency in the banking sector in the town of Alice, South Africa.
**$H_o$**-Technological innovations have not reduced the cost of banking for customers, in Alice town, in South Africa.
**$H_1$**-Technological innovations have reduced the cost of banking for customers, in Alice, in South Africa.

Having formulated the hypotheses for the study, it is necessary to outline the significance of the research and this is addressed in the following section.

## LITERATURE REVIEW

### Theoretical background

Conventional economic efficiency theory states that companies should structure their output to achieve the lowest possible cost per unit produced. Given the combination of fixed and variable costs typical in business, low levels of output are inefficient because fixed costs are shared out across a relatively small number of units. At the other extreme, although above-optimal production can in theory generate economies of scale, in practice, this apparent benefit is often more than offset by additional costs related to the overstressing of existing systems. In the short term, the point of maximum operational efficiency is achieved at the level of output at which all available economies of scale are taken advantage of, yet, short of the level at which the diseconomies of overstraining existing systems come into play. Over the longer term, however, the optimal level of productive efficiency can be raised by increasing the capacity of existing systems (Zerbe, 2001).

The second element of conventional economic efficiency theory relates to the way that existing resources are allocated. The logic is that high levels of competition among producers should prevent them from making excessive profits by raising their selling prices to an unreasonable level above their marginal costs. At the company level, maximum allocative efficiency is achieved when the firm produces the optimal output level of a combination of goods or services to maximize the benefit to the company as a whole. The theory takes account of the fact that company resources are finite and can be used only once, with the result that using a quantity of a material for one purpose involves an opportunity cost, that is, it denies the company the chance to use the same material for another purpose. Allocative efficiency is achieved only when no other pattern of utilization of resources can deliver a better overall result in terms of the welfare of all interested parties. This point of maximum allocative efficiency, at which improvements in one aspect of usage can only be achieved at the expense of losses elsewhere, is sometimes referred to as the Pareto optimal allocation of resources. The theory provides a basic framework to help understand the various factors that are associated with existing operating costs. An understanding of the main principles of the theory could provide scope for managers to find ways of making some elements of their business work more efficiently (Quinzi and Sujaya, 1993).

The theory encourages managers to take a “static” view of their business, with no regard to the possibilities offered by innovation. The rapid pace of technological development over recent years has highlighted this shortcoming in classic economic efficiency theory. Furthermore, the focus on the lowest possible cost can give an overly simplistic representation of the way businesses operate, although, the theory retains value in some low-technology and non-innovative manufacturing applications.

The concept of efficiency, profitability and technological innovations attracted a wide range of research and the attention of various scholars in the past. A number of concepts can be used to explain efficiency in different contexts. Qayyum and Khan (2007:5) suggest efficiency as being the ratio output per unit input in which case they suggested that efficiency is decomposed into two components namely, allocative (economic) and technical efficiency. A firm is said to be technically more efficient than another firm if it can produce more output using a given amount of inputs as compared to another firm (Qayyum and Khan, 2007:5).

Fourie et al. (1994) point out that efficiency is related to principles in the financial sector. They suggested two of such principles namely; the maintaining of the maximum level of competition among market participants and the securing of competitive neutrality between such participants. The reason for the maintenance of maximum level of competition among market participants is that competition is likely to enhance the achievement of high levels of market efficiency, especially, if it should cause the rationalisation of the provision of financial services and the removal of restrictive practices that would impair trading in financial assets.

Fourie et al. (1994:247) further assert that achieving neutrality between market participants would promote the attainment of a high level of efficiency. Competitive neutrality could be defined as a situation in which no party to the financial transaction would enjoy a competitive advantage due to regulation. Porteous and Hazelhurst (2004:30) note that even when technological advances such as the widespread use of ATMs reduced the cost of transacting, the profits were still not as good as those derived from other areas of activities. They also asserted that the most notable among experimental groups is the Standard Bank’s community banking division formed in 1989 to explore ways of lending and transacting (Porteous and Hazelhurst, 2004:30).

Porteous and Hazelhurst (2004:30) observe that in South Africa, the first wave of change in transaction banking began when Standard Bank made a focused and sustained move into the mass market through the launch of a separate E-Bank (electronic banking using the internet) in 1994 which offered an electronic transaction and savings product, through E-Plan, through special service sites. E-Bank grew fast in numbers of clients. This was due to the migration of existing customers from other products as well, to new sign up through dedicated E-Centres. Also, contributory to the banking sector technological advances is the increasing use of cell phones. Porteous and Hazelhurst (2004:30) add that World Bank analysts have suggested that mobile commerce (the use of cell phone in doing trading transactions) and electronic finance are close to take-off

in developing countries as connectivity levels and reliability increases. They predicted that this trend will allow developing countries to leapfrog in the development of their financial systems. For South Africa, 2006 was projected as the take-off year for online banking.

Herferman (2001:25) notes that the retail banking sector has witnessed rapid process technology, where new technology has altered the way key tasks are performed. In his study in the UK, Herferman (2001:25) finds that the number of ATMs in services has risen from 568 in 1975 to 15,208 in 1995, a trend he said was also observed in all industrialized countries. In another study, Berger (2003:143) identifies the changes in the use of selected banking technologies, indicating a significant growth in the use of new information technologies (IT) and financial technology. To this extent, the role of technology in the banking sector need to be addressed critically, as the information and communication technologies (ICT) are changing the banking sector operations and efficiency.

The following section addresses the research design and methodology to be followed by the researchers in collecting primary data for this research.

## RESEARCH METHODOLOGY

### Sample population

Two hundred respondents residing in Alice town were randomly selected for the survey. A stratified random sampling method was used on which the sample was divided equally between respondents using the banking services of Standard Bank and FNB. Therefore, a sample comprising 100 respondents banking with Standard Bank and the other 100 respondents banking with FNB was used to collect data. The use of a stratified random sampling, which is a probability sampling method minimised selection bias since all the respondents had an equal chance of being selected.

### Study design

A quantitative approach was used to gather adequate and reliable field information. In terms of the quantitative approach, the rationale was to profile the market, identify technological innovations in the banking sector and their influence on efficiency and cost reduction for customers. The questionnaire designed for the survey was piloted using 30 respondents. Minor difficulties identified during the pilot resulted in the realignment of the questionnaire for the main survey. The questionnaire designed was then used to capture respondents' responses.

### Data analysis procedure

The collected data was analysed using a descriptive analysis as well as the use of correlation and regression and cause and effect analysis. Descriptive analysis provides a very useful initial examination of the data, even if the ultimate concern of the researcher is inferential in nature (Tustin et al. 2005:523). A statistical analysis package called SAS (Statistical Analysis System) was used to assess the associations among the chosen variables. This was achieved by use of the chi-square tests of association, based on the p-value approach. The collected data was also tabulated and presented graphically to depict the relative effect of technological innovations on the banking efficiency and the costs to customers.

## THE EMPIRICAL RESULTS

The presentation of results in the paper is based on the data analysis process which involved a thorough analysis from each and every question presented in the data collection instrument used (the questionnaire). None of the respondents was a member of staff of the banks. The demographics examined age and gender. The gender composition was 61% male and 39% female. This suggests that more males have banks accounts compared to women. On the age composition, 51% of the respondents were between the ages of 15 to 25 years, 27% were between 26 and 35 years, 17% were between 36 and 45 years, 4% were between 46 and 55 years and only one per cent (1%) was above the age of 55 years. The results suggest that bank customers are young.

### Technological innovations in banks

Ninety four per cent (94%) of the respondents from Standard Bank identified ATMs (Automated teller machines), computers, the internet, cell phone banking, credit cards and online banking as the technological advances they have witnessed in their bank. Ninety eight per cent (98%) of the respondents from FNB identified the same technological advances as above. The results suggest that the banks use almost similar sets of technological innovations in their operations.

### *Technological advances as identified by customers*

The results reviewed that fifty per cent (50%) of the respondents irrespective of whether they are from FNB or Standard Bank were of the view that ATMs have made the greatest contribution towards increasing the efficiency of the banking sector in South Africa.

The reasons cited by respondents of why they think ATMs have made the greatest contributions include their easy accessibility, affordability and less subjectivity to third person human errors. Twenty four (24), twenty (20) and six (6%) goes for the internet, cell phones and computers respectively.

### *Rankings of banks based on their level of use of technological advances*

The study reviewed that the majority of respondents ranked Standard Bank higher than FNB in terms of the use of advanced technologies. Seventy three (73%) indicated that Standard Bank has a higher level of use of technological innovations compared to FNB with twenty

seven per cent (27%). Some customers hold accounts in both FNB and Standard Bank, thus a comparison of the services of each bank by a single customer was possible, with the majority voting for Standard Bank as the best.

Respondents cited that Standard Bank's branch in Alice town makes the best use of its wide range of technological advances and serves customers quickly compared to FNB. The presence of two ATMs for Standard Bank in Alice town, compared to one for FNB, also prompted most respondents to rank Standard Bank as being higher than FNB in terms of the use of technological advances.

Of paramount concern is whether technological innovations have resulted in improved efficiency of the banking sector in South Africa.

### *Improvement in the efficiency of the banking sector*

Ninety-two per cent (92%) of the respondents (consisting of those who indicated strongly agree, fifty one per cent (51%) and agree, forty one per cent (41%)) agreed that the efficiency of the banking sector has improved in the past ten years. Only two per cent (2%) disagreed that the efficiency of the banking sector has improved, while six per cent (6%) neither agree nor disagree.

The perceived improvement was attributed to continued improvements in technologies used in banks. The perceptions of respondents on ATMs, online and cell phone banking on their contributions to efficiency and cost reductions were sought.

### *Evaluation of ATMs*

ATMs (Automated teller machines) were viewed by the respondents as having made the greatest contribution to the improved efficiency of the banking sector. The research and the respondents' evaluation of ATMs on cost effectiveness, user friendliness, efficiency, reliability and convenience are presented below.

#### ATMs on cost effectiveness

The study showed that fifty- three per cent (53%) of the respondents indicated that ATMs are cost effective. Twenty-eight per cent (28%) indicated that ATMs are cost ineffective, while nineteen per cent (19%) indicated that they are neither cost effective nor cost ineffective. This indicated that the majority of respondents, (53%) are of the view that ATMs are cost effective, thus, ATM ranks high in this attribute.

#### ATMs on user friendliness

ATMs also scored higher on user friendliness with sixty eight per cent (68%) indicating that they are user friendly. User friendliness shows that ATMs are easy to operate and have little or negative effects to users. Twenty per cent (20%) of the respondents indicated that ATMs are not user friendly citing that they are difficult to operate, while twelve per cent (12%) were neutral about the issue.

#### ATMs on efficiency

Sixty-seven per cent (67%) of the respondents indicated that ATMs are efficient; twenty two per cent (22%) indicated that ATMs are inefficient, while eleven per cent (11%) were neutral about the issue. The statistics indicated that ATMs also scored high on efficiency.

#### ATMs on reliability

Seventy-four per cent (74%) of the respondents indicated that ATMs are reliable; fourteen per cent (14%) indicated that ATMs are unreliable and twelve per cent (12%) were neutral. Respondents, who indicated that ATMs are reliable, argued that they are free to go to an ATM any time they wish and experience little inconvenience, thus, indicating that ATMs are reliable.

#### ATMs on convenience

Seventy-nine per cent (79%) of the respondents indicated that ATMs are convenient; thirteen per cent (13%) indicated that ATMs are inconvenient, while eight per cent (8%) indicated that they are neutral about the issue. The widespread availability of ATMs in many public places makes it to be easily accessed by customers.

In the overall evaluation, ATMs were considered by the majority of respondents to be cost effective, user friendly, efficient, reliable and convenient. This explains ATMs greatest contribution to increasing efficiency and reducing banking costs for customers as per the views of customers.

### *Online banking*

The study reviewed that online banking has increased efficiency and reduced costs for customers through the reduced need for queuing in the bank for some transaction which should have been done otherwise. Queuing results in customers foregoing some other activities that they should have done, hence the opportunity cost.

Forty-four per cent (44%) of the respondents strongly agree that online banking reduced queuing in banks, thirty-three per cent (33%) agree (this means 77% of the respondents were on the agreeing side), six per cent (6%) neither agree nor disagree, while seventeen (17%) disagree (7% strongly disagree and 10% disagree). The

respondents who disagreed argued that access to the internet is limited to most people in South Africa, thus, most people still have to go and do their transactions in the bank.

### *Cell phone banking*

Sixty-five per cent (65%) of the respondents agreed that cell phone banking is helping in reducing costs of banking. Among the reasons cited included; cheapness of cell phone banking, no costs of travelling to the bank and the convenience of cell phone banking (customers can do their transaction anywhere and anytime). Thirty-five per cent (35%) of the respondents were of the opinion that cell phone banking does not help in reducing banking costs for customers. The reason for their argument ranged from the need for airtime, the need for cell phones with access to internet (that is, a phone with GPRS) which are expensive and the fact that some transaction are simply not feasible using cell phone banking.

### *Technological innovations and costs reduction*

Thirty six per cent (36%) of the respondents showed that they strongly agree with the statement that technological innovations have resulted in cost savings for customers. Thirty-nine per cent (39%) agree, twelve per cent (12%) disagree and one per cent (1%) strongly disagrees, while twelve per cent (12%) neither agree nor disagree. A closer analysis of the figures shows that the majority, seventy-five per cent (75%), (that is, 36 + 39%) of respondents agree that technological innovations resulted in cost savings, while 13% disagreed.

## Suggestions to increase efficiency and reduce costs for customers

The suggestions that were very common with many respondents included the need to increase the number of ATMs, to increase the reach to a number of people, especially in rural areas, to employ qualified staff with knowledge and expertise on the use of new technologies, to motivate staff and to educate customers on how to make the best use of technological advances.

## Problems of technological innovations

The problems identified by respondents include:

- Higher bank charges as banks will be trying to recoup the cost of investment in new technologies.
- Lack of human contact or personal touch.
- Some technological innovations are complex to operate for an ordinary illiterate customer.
- Increase in robberies and fraud cases using advanced technologies.
- Lack of enough skilled staff.
- High cases of identity theft, specifically, in online banking.
- Reduced employment due to automation.

The researchers used statistical inference in testing the research hypotheses of which elements of technological innovations and relative contributions to efficiency improvements and cost reductions for customers were focused on. A 5% level of significance was used, that is, the null hypothesis was rejected if the average p-value was smaller than 5% or 0.05 (see the table below). Based on the average p-values, the researchers failed to accept both null hypotheses. This means that technological innovations have resulted in efficiency improvements in the banking sector as well as reducing banking costs for customers.

**Table 1**

The significance of the results is given by the Chi-square test ($p = 0.05$).

## Conclusions

In overall, the analysis leads to the conclusion that technological innovations have resulted in improved efficiency and banking costs reductions for customers in Alice town. This is depicted by the statistical inferences discussed. The majority of the respondents interviewed showed positive responses with respect to the improvement of efficiency in the banking sector and cost reductions as a result of the use of advanced technological innovations.

The prominent technological advances in the banking sector contributing to the improved efficiency and cost reductions for customers are: automated tellers machines (ATMs), credit cards, computers, the internet and cell phones. ATMs have made the greatest contributions in improving the efficiency and reducing banking costs for customers. This shows that there is need to improve on the use of other technological innovations to further improve the efficiency and cost reductions in banking for the benefit of customers.

Despite the fact that technological innovations have resulted in improved efficiency and reduced costs of banking for customers, customers are facing problems in using these technological advances. Some of the problems resulting from the use of technological innovations include increased levels of fraud and robberies, the technical complexities in operating the new technologies coupled with illiteracy and lack of personal or human contact.

**Table 1.** Average Chi-square and p-values.

| Variable | Observed average Chi-square values | Average p-values | Average degree of freedom |
|---|---|---|---|
| **Hypothesis (i) $H_0$: Technological innovations have not improved efficiency in the banking sector with relation to customers in the town of Alice, South Africa** | | | |
| Contributions of technological advances to improving efficiency | 40.4800 | 0.0001 | 4 |
| Bank rankings in terms of their level of use of technological advances | 78.7400 | 0.0001 | 2 |
| Efficient improvements over the past ten years | 72.8800 | 0.0001 | 3 |
| ATMs and efficiency improvements. | 28.8000 | 0.0001 | 6 |
| ATMs and user friendliness | 29.9200 | 0.0001 | 6 |
| ATMs and convenience | 120.7800 | 0.0001 | 6 |
| Online banking and reduction in queuing | 60.5000 | 0.0001 | 4 |
| Average efficiency improvement value | 61.933 | 0.0001 | 4.5 |
| **Hypothesis (ii) $H_o$-Technological innovations have not lessened the cost of banking for customers in Alice town in South Africa** | | | |
| Cell phone banking and the reduction of costs of banking | 9.000 | 0.0027 | 1 |
| Technological advances' contribution to costs reduction | 30.0000 | 0.0001 | 3 |
| Technological innovations and costs saving | 55.3000 | 0.0001 | 4 |
| ATMs and cost effectiveness | 23.7600 | 0.0006 | 6 |
| Average costs reduction value | 29.515 | 0.00085 | 3.5 |

## RECOMMENDATIONS

The banking sector should be able to determine the technical background of the majority of its customers before endeavouring into the use of advanced technologies. This entails assessing the literacy level of its major customers, the specific needs of its target customers and the potential benefits accruing to customers through the use of current technologies. This can be achieved through carrying a customer research. In addressing the problems that customers face with the use of technological advances and to further improve the efficiency of the banking sector and reduce costs for customers, the banking sector should:

- Engage in customer education on the use of new and advanced technological innovations.
- Carry out compatibility tests before introducing new advances in technology to assess acceptance by customers.
- Improve on the security systems for improved safety in the use of new technologies.
- Develop technologies that are simple to operate for an ordinary customer.
- Employ skilled and qualified staff that would be able to assist customers with the use of advanced technologies.

This will assist the banking sector to further improve its service delivery for the benefit of increased efficiency and ultimately, profitability. Improving the welfare of customers is paramount for the bank to gain a positive image, thus, developing technologies that minimise banking costs for customers is paramount to the success of the banking sector.

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## APPENDIX

**Table 1.** Means.

| Q6 Technological advances | | Q8 Efficiency improvement | Q13 Technological advances and cost saving |
|---|---|---|---|
| 1 | Mean | 1.46 | 1.68 |
| | N | 100 | 100 |
| | Std. Deviation | .576 | .973 |
| 2 | Mean | 1.83 | 1.75 |
| | N | 48 | 48 |
| | Std. Deviation | .859 | .729 |
| 3 | Mean | 1.70 | 2.55 |
| | N | 40 | 40 |
| | Std. Deviation | .723 | .986 |
| 4 | Mean | 1.33 | 2.00 |
| | N | 12 | 12 |
| | Std. Deviation | .492 | .603 |
| Total | Mean | 1.59 | 1.89 |
| | N | 200 | 200 |
| | Std. Deviation | .696 | .960 |