

USING MOBILE PHONES TO IMPROVE ACCESSIBILITY OF PREPAID ELECTRICITY VOUCHER SERVICES

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ABSTRACT

In South Africa, urban areas tend to have better infrastructure and more economic opportunities than rural areas. Whereas the government regards electricity, among other services, as a basic service and need, not all residents have equal access. Currently, there are significant socio-economic disparities within municipalities, with the major differences clearly visible with regards to economic activities, poverty, and access to capital and social infrastructures. Prepaid electricity is seen as a modern form of electricity metering which allows residents the control of their electricity consumption. It also helps provide electricity to residents without them accumulating bills and debts. This paper discusses the results of a case study conducted at *Thulamela* and *Makhado* municipalities in the Limpopo province, South Africa. At these Municipalities, most of the new electricity customers are predominantly poor and the municipalities are experiencing basic service delivery backlogs. Using the Technology Acceptance Model and the Lazer User Model, this paper looks at how the prepaid electricity services and access could be improved by the use of mobile phones, a technology that most rural residents are conversant with.

KEYWORDS: Mobile Phone, Prepaid Service, Electricity Voucher, Technology Acceptance, Lazy User Model

1. INTRODUCTION

South Africa's democratically elected government has inherited huge services delivery backlogs with respect to access to electricity. Prior to the introduction of prepaid electricity, municipalities and the power utility company (Eskom), were providing post-paid electricity to residents - allowing them to consume electricity and then settle the bills later. The costs of metering, billing and collecting dues became huge because many residents especially those from rural areas were too poor to pay for the services they were receiving, resulting in consumers, municipalities and Eskom going into debts. Prepaid electricity was then introduced as a modern form of electricity metering which allows the resident the control of their electricity consumption. This kind of access to electricity appeals better to the poor in both rural and urban areas as it is seen as a way of direct budgeting - bringing the time between payment (purchase) and use (consumption) to as short an interval as possible. In addition to making electricity more affordable to the poor, prepaid stops a customer going into debt as it provides automatic credit control - as opposed to the billed system where the utility company has to do this manually.

The paper looks at the results of a case study conducted at Thulamela and Makhado municipalities in the Limpopo province – one of the nine provinces in South Africa. At these municipalities, most of the customers with newly electricity connections are predominantly poor and these municipalities are experiencing numerous basic service delivery backlogs. One common issue causing backlogs in delivering electricity consistently is the problems experienced by consumers in trying to access or acquire prepaid electricity vouchers from vending points which is the basis for this study. The case study aimed to investigate and examine the current prepaid electricity system called vending points used to assist with the distribution of electricity vouchers/token to the residents. These vending points systems are located at the premises of the different suppliers. The vouchers generated from the vending points are taken home by the residents and entered into their electricity dispensers, thereafter the resident is then free to consume electricity until the credit recorded in the electricity dispensers runs out, at which time the electricity dispenser stop the electricity supply.

This study investigated how well or not well these residents have adapted to this technology, and examine how effective and efficient these vending points are. The investigations also included determining if there are any accessibility issues surrounding prepaid electricity vouchers, investigate the issues surrounding vending points, the viability of using vending points versus mobile phone technology to access prepaid recharge vouchers and also investigate how well mobile technology can be used to improve access to electricity prepaid vouchers. A mobile phone is a portable [electronic device](#) used for mobile voice or data communication over a network. Using mobile phones has become common and has become one of the most vital phenomenon of our lives. Mobile phone technology is considered in this study because consumer applications via mobile technology are already in existence. That is, mobile service providers have the ability to make certain services available via mobile phones such as Internet banking, downloading pictures/videos and purchasing prepaid airtime. This paper argues that the same model for purchasing airtime can be customized to accommodate purchasing prepaid electricity vouchers. The rest of the paper is organized as follows: it gives the theoretical framework underpinning the research, discusses the findings, and lastly gives the conclusion.

2. RESEARCH THEORETICAL FRAMEWORK

Research involving investigations on technology acceptance based on modelling and measuring individual motivational characteristics have been of critical importance in the past few years (Lapezynski, 2006). Information Technology is shaping itself as a backbone for growth and development of people's lives globally. Computer systems cannot improve performance if they aren't used. Global efforts made in computing and information technology are changing the way people meet and communicate, and this has led to more IT investigations on technology acceptance. As new information technologies infiltrate workplaces, homes and classrooms, research on user acceptance of new technologies has started to receive much attention from professionals as well as academic researchers (Mazhar, 2006). In studying user acceptance and the characteristics that influence the use of technology, the Technology Acceptance Model (TAM) is one of the most cited models.

TAM places more emphasis on subjective/psychological predispositions and social influences on behavioural intention to adopt an innovation (Garson, 2007). TAM, which was adapted from the Theory of Reasoned Action (Ajzen and Fishbein, 1975) and originally proposed by Davis (1989), assumes that an individual's information systems acceptance is determined by two major variables:-

- Perceived Usefulness (PU) - this was defined by Fred Davis (1989) as "the degree to which a person believes that using a particular system would enhance his or her job performance" i.e. people tend to use or not use an application or system to the extent they believe it will help them perform their job better.
- Perceived Ease of Use (PEOU) – Davis (1989) defined this as “the degree to which a person believes that using a particular system would enhance his or her job performance” i.e. people believe that the the performance benefits of usage are outweighed by the effort of using the application or system.

Thus, TAM helps information technology researchers gain useful insight to the people reaction towards technology acceptance from a measure of their intentions and the ability to explain their intentions in terms of their attitudes, subjective norms, perceived usefulness, perceived ease of use, and related variables. To this point, Technology Acceptance model was used as an underpinning theory in this paper. This model was chosen to gain understanding of the consumers' attitude towards using and actual usage of the vending points system as this model addresses acceptance and adoption of technology by users.

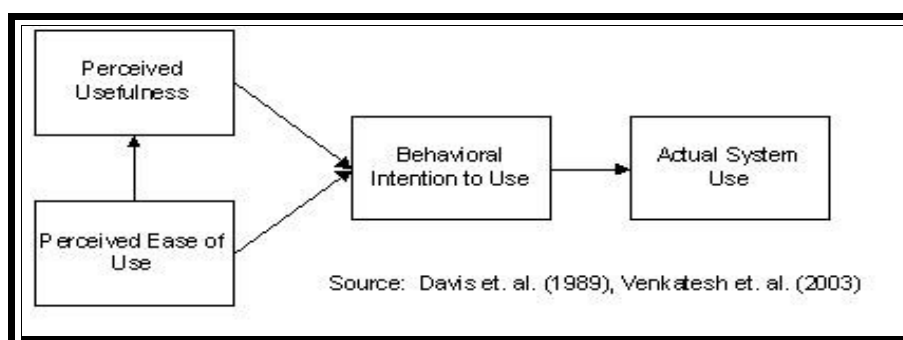


Figure 1. Technology Acceptance Model. (Davis, 1989; Venkatesh, 2003)

Nevertheless, one of the shortcomings of TAM is to predict the success of a new services & technologies. One way to predict product or service adoption is to understand that people's behaviours are influenced by the options available and sometimes their peers. When users are presented with more than one option, Collan and Tetard (2007) indicate that a user will often choose a solution or a service that will fulfil their needs with the least effort and hassle-free from their side. They believe that focusing only on one technology is a very big obstacle for any kind of prediction ability as it is clear from common logic that a person looking at a new technology will compare it to the existing (old) technology and take the one that is better (Collan and Tetard, 2007).

This is addressed by The Lazy user model which indicates that when a user is presented with the available plausible solutions that fulfill the user need, the user will select a solution from the set to fulfill the need based on the lowest level of effort and/or cost (Collan and Tetard, 2007), mainly focusing on the process of selecting the solution rather than technology acceptance. As mentioned already, this model is determined by two major variables:-

- User need – a need that the user wants satisfied or a user has a problem that requires a solution. One may therefore assume that a consumer has a problem and wants this problem solved immediately. In order to address and understand the needs of users, a detailed user needs assessment must be conducted. The need of a user enables the ultimate development of tools, methods or solutions useful in fulfilling these needs (Garcin, 2003).
- User state – a set of solutions suitable or available to the user to meet the user need. This means that people only use the solutions to the problem based on the solution’s availability at the time of the problem which is basically the description of both the user and the circumstances that surrounds the user at the time of the need (Fredriksson, 2009).

Since TAM does not cover the aspects on the needs of consumers to adapt to new technology, this model was used to investigate the need to introduce a new technology for purchasing prepaid vouchers and establish if consumers would be willing to adopt it to fulfill this need. TAM is applied in this research to investigate how the community members of Thulamela and Makhado have adopted to using prepaid electricity vending points. Based on the outcome of this investigation, the Lazy User Model was then applied to assess and establish whether introducing a new method of accessing prepaid voucher, a mobile phone, as an alternative option can yield better access results.

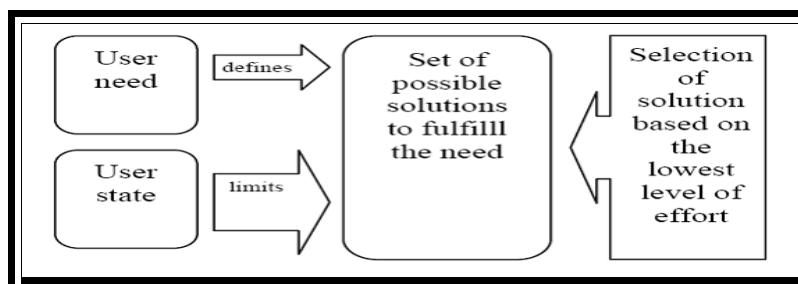


Figure 2. The Lazy User Model. (Collan and Tetard, 2007)

Since the The Lazy User model focused on more than one technology and also focuses on the user when trying to predict the user behaviour , it was therefore adopted to show that if an alternative method to purchase electricity vouchers via mobile phones is made available to the consumers, based on the consumers’ current need and state (familiarity with the technology), the process of accessing prepaid vouchers by the consumers of these municipalities can be optimised and accessibility issues can be minimised. In the same

breath, TAM was used again to understand the consumers' familiarity with mobile phone technology.

3. DATA ANALYSIS

This study was complemented by analysis of the collected qualitative questionnaire data. With qualitative research, analysis is often started by analyzing and counting the distribution of answers question by question (Talja, 2008). Qualitative research involves analysis of data such as words from interviews with the aim to classify features, count them and construct models in an attempt to explain what is observed (Myers, 1997).

Over 130 questionnaires were deployed to different data collections sites in Thulamela and Makhado. These questionnaires contained a controlled series of printed questions that were used to obtain information from respondent from the identified areas. The analysis of each questionnaire probe was in three parts: what the researcher wanted to know, the learner's experience and a brief discussion. The research questions were grouped according to the following research themes and queries:

Theme 1: What is the user experience with vending points? - Questions on user experience were presented to consumers to establish if they perceive any problems with the process of acquiring prepaid vouchers. The responses showed these consumers are frustrated with the process of accessing prepaid vouchers. The unhappiness from the consumers indicated that there was a problem that needed to be addressed. Most of the consumers did not find the vending points as an effective and useful tool to purchase prepaid electricity vouchers. One can deduce from these answers that consumers do not have the flexibility of acquiring prepaid vouchers at any point in time when required. Consumers currently feel restricted as there's currently only one option to purchase electricity vouchers i.e. via vending points, so they are forced to bare the brunt through using whatever means is made available to them. The fact that they continue to use the vending points despite the unhappiness it causes, shows the need for new product/service/solution used to access prepaid electricity vouchers by the consumers.

Theme 2: What is the user experience with mobile phone? – Questions on the familiarity and current uses of mobile phones were presented to these consumers. The answers provided showed that all the participants owned and make use a mobile phone. The answers showed that the mobile phones have penetrated rural areas and transformed the poorer service economy by giving them an affordable, quicker and effective way to communicate. Majority of the participants' responses showed use a mobile phone to stay in touch with family, to know when there was an emergency and be able to respond quickly. This showed that the mobile phone is seen as a mechanism or a tool that make life easier i.e. the perceived usefulness of the mobile phones.

Theme 3: What is the impact of the location of the vending points? – Questions on the distance and the environment where the vending points are located were posed to consumers. Some of the answers from consumers indicated that although the vending points are located at areas that are frequented by people, this does not necessarily make them easily accessible as consumers still need to travel (outside their homestead) to purchase vouchers. Also, some vendors do not operate after the normal business hours (i.e. before 8 am and after 17:00) and weekends. The answers provided showed that the consumers do not have the flexibility of accessing prepaid vouchers when required and consumers feel restricted by the operating times of the vendors. This makes the whole process of accessing and acquiring electricity prepaid vouchers a daunting and non-pleasing encounter for consumers.

Theme 4: What is the consumer awareness of the services via mobile phones? – Questions on familiarity of services available via a mobile phones. There were also questions on whether consumers do make use of services available via mobile phone such as SMS, MMS, airtime recharges etc. The answers provided showed that these consumers were familiar and also make use of these services available via the mobile phone. Although some of the answers from the consumers showed that users are not entirely knowledgeable on how to use some of the advance functionality of the mobile phone such as internet banking, the interest to explore does exist and mobile phones are not perceived as complicated tools. These consumers already find it easy to use the phone for basic things like dialling a number and sending SMS's to communicate.

Theme 5: What are the Gauteng Province user experiences with mobile phone to purchase prepaid electricity vouchers? – Questions on the experiences with using mobile phones to purchase prepaid electricity vouchers were posed to Gauteng consumers. The answers showed that this service of purchasing prepaid electricity vouchers is fairly new to most consumers in Gauteng. The answers provided also highlighted that the functionality used to purchase vouchers via mobile phone was no different from what consumers were already exposed to via the mobile phone. The experiences with mobile phone use to purchase vouchers by Gauteng consumers showed that most challenges such as distance, time and place (venue) restrictions experienced by consumers in Thulamela and Makhado are alleviated through the use of mobile phones. The next section discusses the findings of this study.

4. DISCUSSION OF FINDINGS

The following were identified as some of the challenges with prepaid electricity vending points:

- Consumers are currently frustrated by the fact that vending points are located too far away from their homes. Consumers are only able to buy electricity from a limited number of vendors located within the vicinity of their homes and businesses. Consumers need vending points that are easily accessible; and are able

to provide quick and easy access without costing them extra money. Some consumers are forced to pay for transport to travel to places or areas where they can purchase electricity vouchers. In the end, it costs them more money to access prepaid vouchers. The objective of the vending service is to ensure easy accessibility to every consumer; this is not entirely the current status quo in both Thulamela and Makhado. The main idea must be to provide a convenient and independent vending infrastructure to service consumers that use prepaid electricity in a quick and less costly means.

- Vending points are only open during office hours and at times are not functioning properly; there seem not to be well thought-out procedures and preventive maintenance for responding promptly and effectively to out-of-service vending points or consumer complaints. It must be noted that there is value in preventative maintenance, it helps increase and build customer confidence. This is still lacking in this province and thus leaves customers feeling frustrated when they cannot readily access electricity prepaid vouchers due to faulty vending points. Consumers that are confident that a machine will work are much more likely to want to use the service and so it is well worth the operator's while to establish that trust. The point-of-sale should be available (able to vend) during the time periods convenient to the consumers
- One issue mentioned by consumers was long queues. This is currently being experienced in areas where there aren't sufficient vending points due to some vending points being faulty and some located too far away from consumers. This normally happens towards end of the month when people have money to buy electricity units after having received their hard earned wages.
- Vendor lock – this was identified by some of the consumers as a very big concern that's impeding consistent access of electricity vouchers. Vendor locks currently occurs due to the fact that most vending points that are in circulation when the machines were first put into use about 20 years ago, were designed to operate independently because remote data communication was not available . The power utility is still trying to migrate to a more secure online vending system and closing down all “off-line” machines causing vendor lock. The system inconsistencies occurred because the focus of specification and standardization by distributors was on electricity dispensers rather than system and infrastructure required to support electricity dispensers. To ensure consistent provision and accessibility of electricity vouchers, a consumer must be able to buy electricity at a range of sales points irrespective of metering system being used.
- The social impact of introducing electricity to these municipalities is enormous. There are the obvious benefits of improved social services such as lighting at health centers, schools and promoting community services such as milling of grain, sawmills or battery charging .The fact that the suppliers operate during certain hours hinders the residents from accessing these prepaid electricity vouchers as per demand and thus impacts the productivity levels.

Besides the challenges with prepaid vouchers through using the vending point, this study also looked at providing prepaid electricity voucher services from a mobile phone as currently adopted by other provinces and municipalities. This is due to the fact that mobile

phone-based services are becoming more prominent worldwide and South Africa is no exception. Anecdotal evidence show that businesses and users are realizing the convenience and benefits of using mobile phones to provide service such mobile banking and purchasing prepaid airtime via mobile phone and as well as mobile advertisements to consumers.

The study also was able to establish through TAM that the residents of these municipalities are very much conversant with a mobile phone device. One can therefore deduce that the skill to operate a mobile phone definitely exists within these municipalities. When consumers were presented with the option of purchasing the electricity vouchers via mobile phone as an alternative option to using vending points, most of the residents were keen and very much interested in wanting try it. Using mobile phone will save costs to travel to areas where the vending points are located to purchase vouchers since most of them are not within walking distance. This service via mobile phone will offer more flexible way to purchase vouchers anywhere at any point in time. The consumers will not need to stand in long queue to purchase prepaid vouchers and hence make life a little easier.

By using the Lazy Model, one can easily deduce that mobile phone technology is bound to be more successful than using vending points since it can help solve most of the common problems currently experienced by consumers such as long queues, spending money to travel to the supplier's point of sale and vending machines being offline. The consumers are very much conversant with the use of mobile phone and most of them have already absorbed using mobile phones in their daily lives. Most of the consumers find using the mobile phone easy to use the tool for basic things like dialling a number and sending SMS's as a means to communicate. Using a mobile phone to purchase electricity vouchers will require the resident to use their mobile phone anywhere and anytime at their own convenience with no additional costs on transportation or having to wait on long queue to purchase vouchers. Since the consumers are already familiar with basic functionalities of the mobile phone and based on the answers received, using mobile phone technology to purchase vouchers will require less effort from their side and would be painless, convenient and effortless compared to the current process.

5. CONCLUSION

This paper has shown that ICTs, especially mobile technologies, could be key to improving service delivery and are one of the essential factors in promoting growth in the South African economy. Municipalities and government entities are gearing towards achieving delivery results and attempting to be more service delivery orientated. The country's ICT development is trying to focus on using technology for economic and social development hence the introduction of prepaid electricity and vending points' technology to dispense the prepaid vouchers to community members help propel a culture of ICT innovation. The paper provided evidence that there are major challenges with regards to consistent accessibility of electricity vouchers through the use of electricity vending system. Mobile

phones could greatly help bridge the disparities between service delivery in rural areas and urban areas. The mobile phone solution would help improve quality of service as well as offer consumers the flexibility of when and where they can purchase electricity prepaid vouchers. Mobile phones are well received and adopted in South Africa, thus using them to purchase prepaid electricity will expedite access and help alleviate challenges rural residents face with respect to electricity service and purchase.

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