Readiness for banking technologies in developing countries

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A B S T R A C T

Banks in developing countries are increasingly relying on innovative technologies such as cellphone banking, landline telephone banking, internet banking and automated teller machine (ATM) banking to penetrate existing markets and to create new markets. The banking industry in South Africa, as a developing economy, is regarded as sophisticated, but providing banking facilities to the 'unbanked' in South Africa remains a challenge. Consumers are not equally ready to adopt technology-based products, with technology readiness defined as "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work". In the developing economy examined, a Technology Readiness Index (TRI) score of 2.53 for urban consumers was calculated. Such a TRI score is well below that of a developed economy such as the USA, whose score is 2.88. This could imply that consumers are not as ready to adopt technology, which needs to be taken into account by banks when doing product development and investing resources to increase customer satisfaction.

Key words: Technology Readiness Index (TRI), developing economies, technology readiness

Introduction

Continuous innovation is seen as the core of marketing models in developing countries. Businesses in developing countries are increasingly relying on innovative

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technology to create new markets or penetrate existing markets (Chipp, Hoenig & Nel 2006). By combining traditional physical facilities with modern telecommunications, businesses in developing countries are building unique ways to market products and services (Prahalad 2006). In the banking industry, innovative technology-based products and services such as cellphone banking, landline telephone banking, internet banking and automated teller machine (ATM) banking are not only seen as innovative technologies for providing financial services to existing bank customers, but also essential technologies in expanding the provision of banking products and services to poor consumers who are generally 'unbanked'. In particular, the cellphone is seen as an important technology in expanding the provision of financial services to the 'unbanked' population (Leach, Beghin, Pickens & Moran 2007).

Chen (2005), as well as Sheth and Sisodia (2006), argue that these innovative technologies are driving the trend whereby customers are providing services for themselves (in other words, self-service technologies), and that in future, the only human interaction will be when the service is initially created and when it is finally terminated. This drive to allow customers to provide their own services presents several benefits. For customers, the benefits include an increased perception of control, increased speed in obtaining services, improved access to services and financial savings incurred by using these services; while for banks, the benefits include reduced labour costs and/or the ability to relocate employees to more productive activities. Engaging technologies may also improve the organisations' reputation amongst customers, as customers expect organisations to embrace new technologies and provide a competitive advantage (Meuter, Bitner, Ostrom & Brown 2005).

Despite these benefits, there is mounting evidence that consumers are becoming more frustrated in dealing with technology-based products and services, and that customers are seeking a better balance between technologies and direct personal contact (Parasuraman 2000). A number of studies have also shown that there is a degree of technophobia or technology pessimism amongst customers confronted with technology-based products and services (Edison & Geissler 2003; Meuter, Ostrom, Bitner & Roundtree 2003). From the organisation's perspective, it has been suggested that technological development has not yielded the improvement envisaged due to the challenge of getting customers to use this technology (Curran & Meuter 2005).

A seemingly promising theoretical concept, developed by Parasuraman (2000) to understand the behavioural process of adopting and using technologies, is that of 'technology readiness'. As the utilisation of these technologies is based on characteristics such as technology readiness, it is therefore important for banks in developing countries to better understand the relationship between technological

readiness and technology-related adoption and behaviour of existing and prospective customers.

Purpose of the paper

The purpose of this paper is to measure the technology readiness of a developing country's urban consumers, and to determine the relationship between technology readiness and key demographics, access, usage and desirability profiles of banking customers in a developing country context.

The primary research objective of the research study is to determine the technological readiness of developing countries' consumers, in an urban environment, using the dimensions identified by Parasuraman (2000). Based on this objective, the following research questions can be posed: Are urban customers in developing countries more (or less) technologically ready than those in developed countries? Are customers who currently have access to technologies more technologically ready? Are customers who currently use technological banking services more technologically ready? Are customers who have a higher perceived desirability of using technological services more technologically ready?

Technological readiness

Defining technology readiness

Technology readiness can be defined as "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work" (Parasuraman 2000). It thus suggests the extent to which consumers are prepared to use new technologies, rather than their actual ability in this regard (Caison, Bulman, Pai & Neville 2008). Meuter et al. (2005) argue that the technological readiness of customers is crucial in the trial and use of new technologies. In fact, Parasuraman (2000) found that technological readiness is a good predictor of technology-related behaviour, and therefore argues that knowing the technology readiness of customers could assist a business in developing its technology strategy, as well as the way in which it manages the link between customer and technology.

Technology readiness and the adoption of technology by consumers

Adoption is a micro-process that takes place among consumers, resulting in the decision to reject products, services and ideas (Schiffman, Bednall, O'Cass, Paladino, Ward & Kanuk 2008: 498). It has been suggested that the challenge with technology is not the technology itself, but rather its use among consumers (Curran & Meuter 2005). The development of technology has resulted in the introduction of self-service terminals (SSTs) in a wide variety of situations where consumers can receive a service without the assistance of employees. In the case of banking, this has been seen in ATMs and online transactions. In other instances, the development of technology has made it possible to move to a paperless transaction, as in the case of SARS (South African Revenue Service) eFiling in South Africa.

Measuring technology readiness

In order to measure consumers' readiness to embrace new technologies, Parasuraman (2000) developed a multiple-item scale known as the Technology Readiness Index (TRI). A confirmatory factor analysis of the measurement scale was used to test and validate that a four dimension model (36 statements) of technological readiness was reasonable. The four dimensions of TRI identified were:

1. Optimism (10 statements): A positive view of technology and a belief that it offers people increased control, flexibility and efficiency in their lives. Optimism is a driver of technology readiness.
2. Innovativeness (7 statements): A tendency to be a technology pioneer and thought leader. Innovativeness is also a driver of technology readiness.
3. Discomfort (10 statements): A perceived lack of control over technology and a feeling of being overwhelmed by it. Discomfort is an inhibitor of technology readiness.
4. Insecurity (9 statements): Distrust of technology and scepticism about the ability to work properly. Insecurity is also an inhibitor of technology readiness.

Of the four dimensions, optimism and innovativeness are drivers of technological readiness, while discomfort and insecurity are inhibitors of technological readiness. Using the TRI, Parasuraman and Colby (2001) provided a taxonomy of technology customers. On the basis of the customer's level of technology readiness, they described five types of customers: explorers, pioneers, sceptics, paranoids and laggards, with the explorers being the most technologically ready and the laggards being the least technologically ready.

South Africa as a developing economy

According to Hough, Neuland and Bothma (2003), economies can be categorised as being developed, developing or less-developed. Developed economies (such as the USA and Japan) are characterised by political stability, highly educated and literate populations, high levels of innovation and entrepreneurship, as well as high levels of both industrial and information technology. Less developed economies have political instability (sometimes political anarchy), government inefficiency, low standards of living and low levels of economic wealth. A developing economy (or emerging economy) is defined as markets that are in the process of evolving to becoming developed (in other words, higher income) (Ali 2007; Hough et al. 2003).

Another measure of development in a country is the Human Development Index (HDI), which measures the quality of life in a country by examining a citizen's life expectancy at birth, the level of education of citizens and whether the incomes of citizens are sufficient to meet their most basic needs (Hill 2007). Based on the *Human Development Report* for 2006, South Africa's HDI value is 0.653, and the country is ranked 121st in the world on the HDI (UNDP 2007).

South Africa is also classified by the United Nations as a developing economy (UN 2007). According to Hough et al. (2003), developing economies have the following characteristics:

- Improving educational standards, literacy and work skills levels
- Relatively efficient technology systems
- Relative political stability and a movement towards market-based economies
- Rapidly expanding financial services.

As a developing economy, South Africa exhibits opportunities for growth in financial services. As alluded to earlier in this paper, it is important for businesses such as banks providing financial services in South Africa to be familiar with the technological readiness of South African consumers, their willingness to adopt technologies and their actual consumer behaviour with regard to technology usage.

Technology and banking services in South Africa

In African markets, it has been suggested that the average consumer does not exist, as the continent is characterised by dual markets, where it is possible to identify rich and poor consumers (Luiz 2006).

The banking industry in South Africa is regarded as a sophisticated one. Providing banking facilities to the 'unbanked' in South Africa remains a challenge, as is the

case in other developing markets. Despite the dual markets, cellphones have been identified as a means of bringing the bank to the rural areas, the generally 'unbanked' (Esbach 2007; Formby 2006). Cellphone banking may be more affordable than traditional banking (Dewing 2006), making it attractive to this market. It is also attractive to this market, as it has been determined that one third of people in South Africa and Botswana who do not have a bank account, have a cellphone or access to one (Dewing 2006).

Research conducted in South Africa during 2007 indicated that 42% of the population has never heard of cellphone banking, while another 28% did not know what it meant in practice (Leach et al. 2007). It is thus important for the marketer to be aware of the technology readiness in the market and how this readiness can be used to encourage the use of cellphone banking by a broader base of specifically low-income people.

Hypothesis development

Before it is possible to determine the relationship between technology readiness and key demographics, access, usage and desirability profiles of banking customers in a developing country context, it is necessary to test and confirm the dimensionality of the Technology Readiness Index (TRI). Thus, hypothesis 1 is formulated:

Hypothesis 1: Developing country data will yield the same four dimensions of technology readiness as established by Parasuraman (2000).

Numerous studies have examined the differences in the adoption of new technologies between individual customers (Tsikriktsis 2004; Agarwal & Prasad 1999; Harrison & Rainer 1992; Gutek & Bikson 1985). In these studies the key demographic differences between the customers were based on age, gender and education. Results from several studies have found that there is a negative relationship between age and the acceptance of new technology or the skills required to use the technology (Tsikriktsis 2004; Harrison & Rainer 1992). Parasuraman (2000) found that customers who own or subscribe to technology products and services (particularly cellphones) were more technologically ready than customers who did not own or subscribe to technologies. In developing countries, ownership or subscription may be misplaced, and the real issue is access to technology products and services, rather than ownership or subscription. For example, in Africa customers often do not own or subscribe to cellphones, but rather use private cellphone kiosks (which have replaced most public landline phones). The issue is thus related to access, rather than ownership. Thus, hypothesis 2 is formulated:

Hypothesis 2: Customers who currently have access to technology-based products and services are more technologically ready than those customers who currently have no access to technology-based products and services.

Parasuraman (2000) further found that customers who use, or have a desire to use, technology-based services in future were more technologically ready than customers who did not use, or have a desire to use, technology-based services in future. Tsikriktsis (2004) found slightly conflicting results, which suggested that less technologically ready customers did in fact use some technology-based services such as cellphones, text messaging, ATMs and online purchases and did show a future desire to use technology-based services such as email, Internet and electronic bank accounts. Thus, hypotheses 3 and 4 are formulated:

Hypothesis 3: Customers who currently use technology-based banking services are more technologically ready than those customers who do not currently use technology-based products and services.

Hypothesis 4: Customers who have a higher perceived desirability for various technology-based services are more technologically ready than those customers who have a lower perceived desirability for various technology-based services.

Research methodology

The empirical part of the study is quantitative in nature. This approach suits the purpose of the research and the aim to draw a substantial sample of the population under study. The instrument used in the study and originally developed by Parasuraman (2000) is a quantitative instrument.

The study is exploratory in nature, where exploratory research is regarded as reasonable when there is little scientific knowledge about a phenomenon, yet there is reason to believe that there are elements worth discovering (Stebbins, in Grove, Fisk & John 2003). This study attempted to determine the elements associated with the Technology Readiness Index and their existence in a developing country, which is an area that has received little attention from researchers.

The population of the study

In this instance, the citizens of the country reflect the population of the study. It is not possible to obtain the list of population elements for the research, and therefore not possible to draw a random sample of respondents from the target population.

The population chosen for the study was urban consumers in South Africa, more specifically in Gauteng province.

This population was appealing, because South Africa is a developing country, yet it has a sophisticated banking infrastructure that offers a full range of new banking technologies (which are comparable to the latest technologies used in developed countries). Furthermore, South African banks are currently introducing new technologies to bank the 'unbanked'.

Sampling in the study

The sampling method that was used was a non-probability sampling technique, namely convenience sampling. The questionnaire was administered to a convenience sample of 2 475 urban consumers in Gauteng, South Africa.

The research instrument

The survey was conducted through an anonymous, self-administered structured questionnaire. The instrument used contained the statements developed for use in the National Technology Readiness Survey (NTRS) developed by Parasuraman (2000), which had been used to develop a TRI score, as already discussed. The questionnaire consisted of the following five sections:

- The first section contained questions pertaining to the respondent's basic demographics.
- The second section contained questions about the respondent's access to certain technologies.
- The third section contained questions about the respondent's usage of certain technological banking products and services.
- The fourth section contained 36 statements representing the four dimensions (namely, optimism, innovativeness, discomfort and insecurity) of Parasuraman's (2000) Technology Readiness Index. Respondents were requested, on a five-point unlabelled Likert scale (from 'strongly disagree' to 'strongly agree'), to indicate their opinion on statements relating to banking technological readiness.
- The final (fifth) section contained questions pertaining to the respondent's perceptions of the future desirability of various technology-based services. Respondents were requested, on a six-point Likert scale (from very 'desirable' to 'very undesirable'), to indicate their opinion on statements relating to perceived future desirability.

Pretesting

Pretesting was conducted among 40 students associated with a Gauteng university. After pre-testing the questionnaire, it was decided to make minor changes to the language in some of the statements, so that they would be better understood in South Africa. Furthermore, the statements were modified to deal specifically with the banking industry.

Data collection

Fieldworkers were used to distribute the research instrument (questionnaire) to respondents. As already indicated, respondents were required to complete the questionnaire and hand it back to fieldworkers upon completion.

Data analysis

Once the data had been collected, they were captured and collated using SPSS. In order to test the dimensionality and reliability of the Technology Readiness scale, it was necessary to conduct an exploratory factor analysis and reliability analysis. The purpose of the factor analysis was to assess the dimensionality in order to confirm that the items for each dimension load highly on to a single factor. Reliability analysis was conducted to test the internal consistency of the entire scale (Paul-Peter 1979). For the technology readiness constructs to be reliable, Hair, Bush and Ortinau (2006) affirm that the generally agreed lower limit for Cronbach's alpha coefficient is 0.70.

Based on the analysis of the results, one statement from each of the Optimism and Innovativeness dimensions was removed due to low scores. In the Discomfort dimension, three statements were discarded, while one statement was discarded in the Insecurity dimension. This means that the original 36-item scale was reduced to 30 items for the purposes of further statistical treatment.

In order to test the hypotheses formulated for the study, two parametric tests were used. The t-test for independent samples was used to determine whether the means of two groups were statistically significantly different. The one-way ANOVA was used to determine whether the means of more than two groups were statistically significantly different. A post hoc test, Dunnet's T3, was used to identify the groups between which significant differences exist when equal variances cannot be assumed, while the Scheffe's post hoc test was used to identify the groups between which significant differences exist when equal variances can be assumed (Eiselen, Uys & Potgieter 2007).

Parametric tests are suitable when the dependent variable is measured on an interval or ratio scale, when the dependent variable is normally distributed, and when the sample size is larger than 30 respondents (Eiselen et al. 2007). Pallant (2007) states furthermore that the use of both parametric and non-parametric tests requires a random sample of the population, but drawing such a sample is hardly ever possible in a real-life setting.

In this study the variables in question were measured on an interval scale, since respondents had to indicate their level of agreement on a five-point unlabelled Likert scale. West, Finch and Curran (1995: 74) state that a variable with a skewness of the distribution of less than 2.00 and a kurtosis of the distribution of less than 7.00 falls within what could be considered acceptable levels of normality. All variables fall within these limits and can therefore be assumed to show a normal distribution. The sample size in this study is 2 475 respondents and is considered large.

In order to interpret the results of the parametric tests used to test the hypotheses, the authors relied on a 5% level of significance or 95% level of confidence. A p-value of 0.05 or less is therefore indicative of a significant difference between the means of the groups under consideration.

Findings of the research

The findings initially focus on the profile of the typical respondent, after which the specific findings regarding TRI and the hypotheses are discussed.

Reliability of the scale used to measure TRI

The reliability of the scale used to measure TRI was determined using Cronbach's alpha. The 30 items (with the exclusion of the six statements identified earlier) had a Cronbach's alpha of 0.785, which is greater than the 0.7 suggested by Hair et al. (2006) as acceptable. This confirms that the scale that was used is reliable.

Construct validity

Construct validity is assured through the use of the National Technology Readiness Survey (NTRS) developed by Parasuraman (2000), which was used to develop a TRI score.

Respondent profile

The respondent profile is found in Table 1.

Table 1: Respondent profile

Characteristic	Distribution	
		%
Age	Younger than 20	9.6
	20–29 years	45.1
	30–39 years	12.2
	40–49 years	17.4
	50–59 years	11.9
	60–69	2.6
	70 and older	1.2
Gender	Male	48.1
	Female	51.9
Education	Primary school or less	1.6
	Some high school	8.3
	Matric	38.7
	Technical qualification	19.3
	Undergraduate degree	26.5
	Other	5.6
Home language	Afrikaans	15.1
	English	54.2
	Nguni languages	12.4
	Sotho languages	12.6
	Tshivenda	2.9
	Other African and European languages	2.7
Employment status	Employed on a full-time basis	61.8
	Employed on a part-time basis	9.4
	Student	19.2
	Housewife	3.3
	Retired	2.2
	Unemployed	4.1

Specific findings relating to the ownership of technology-based banking products and services

Respondents were asked to indicate which technological products and services they currently have, how many they planned to obtain in the coming year, and those that they have no plans to acquire.

From the responses received, it can be seen that the majority of the respondents currently have a bank account (95.6%). With regard to credit card ownership, 55.3% indicated that they currently had a credit card, while 30.8% indicated that they have no

plans to acquire a credit card. The percentage of respondents who indicated that they currently have a cellphone (97.3%) is consistent with other research conducted, which indicates a high degree of cellphone ownership in South Africa. Furthermore, 74.3% indicated that they currently have landline telephone access, but this is lower than the number of respondents who currently have a cellphone. Among the respondents, the current ownership of internet access via a landline was 51.9%, while current ownership of internet access via broadband was 44%. The number of respondents who had no plans to get internet access (either landline or broadband) is at relatively similar levels, namely 32.5% and 32.0% respectively. Current ownership of wireless handheld devices among respondents was 14.1%, while the majority of respondents (68.7%) had no plans to acquire such a device. The findings are reflected in Table 2.

Table 2: The ownership of technology-based banking products and services

Technology-based banking products and services	Currently have (%)	Plan to have in the next 12 months (%)	Have no plans to get (%)
Bank account	95.6	2.8	1.6
Credit card	55.3	13.8	30.8
Cellphone	97.3	1.5	1.2
Landline telephone access	74.3	7.4	18.3
Internet access (landline)	51.9	15.6	32.5
Internet access (broadband)	44.0	23.9	32.0
Wireless handheld device (for example, Blackberry)	14.1	17.2	68.7

From these responses, it can be seen that the current ownership of the typical respondent seems to include the following: a bank account, a credit card, a cellphone, landline telephone access and internet access via either a landline or broadband; but they have no plans to obtain a wireless handheld device.

Specific findings relating to the usage of technology-based banking products and services

Respondents were asked to indicate their usage of various products and services in the previous 12 months, those that they plan to use in the next twelve months, as well as those that they have no plans to use.

From the responses received, it can be seen that the majority of respondents (87.4%) had used ATM banking in the last 12 months. Regarding cellphone banking, relatively similar numbers of respondents had used cellphone banking in the past 12 months or planned to use it in the next 12 months, namely 24.7% and 24.2% respectively. The majority of respondents (51.1%) indicated that they had no plans to use cellphone banking. The situation with regard to landline telephone banking was similar to that pertaining to cellphone banking, in that relatively similar numbers currently used and planned to use it in the next 12 months (14.4% and 12.3% respectively). Similarly, the majority of respondents (7.4%) indicated that they had no plans to use this service. With regard to internet banking, 4.1% of respondents indicated that they had used this in the past 12 months. The majority of respondents (53.5%) indicated that they had no plans to use the SARS eFiling service. A high percentage of respondents (48.5%) indicated that they had used SMS or email banking notification services. The majority of respondents (66.6%) indicated that they had no plans to use online shopping via banking reward schemes. The findings are reflected in Table 3.

Table 3: The usage of technology-based banking products and services

Technology-based banking products and services	Have used in the past 12 months (%)	Plan to use in the next 12 months (%)	Have no plans to use (%)
ATM banking	87.4	4.7	7.8
Cellphone banking	24.7	24.2	51.1
Landline telephone banking	14.4	12.3	73.4
Internet banking	45.1	23.8	31.1
SARS eFiling (Internet tax return)	15.3	31.2	53.5
SMS or email banking notification	48.5	21.5	30.0
Online shopping via banking reward schemes	13.0	20.4	66.6

Technological readiness

The scale used in this section was an unlabelled 5-point Likert scale, where 1 represents 'strongly disagree' and 5 represents 'strongly agree'. The most significant statement in this section related to the nature of the contact that the customer wants with the bank. The statement read, "When I call a bank I prefer to talk to a person rather than a machine", and this statement had a mean score of 4.39 (on a five-

point scale) and a standard deviation of 0.975. This is the highest mean and the lowest standard deviation of all the statements. Table 4 provides an exposition of the descriptive statistics.

A secondary objective of the study was to determine an overall Technology Readiness Index (TRI) score in a developing country context. From the responses received, the average was calculated for each dimension. The Discomfort and Insecurity dimensions are inhibitors of technology readiness and were reverse scored in order to calculate an overall TRI score. Optimism and Innovativeness, however, are drivers of TRI and are not reverse scored. This enabled the calculation of an overall TRI in a developing country context, where an overall TRI score of 2.53 was determined, which is close to the midpoint of the measurement scale of 2.50. The Optimism, Innovativeness and Insecurity dimensions are negatively skewed. The Innovativeness, Discomfort and Insecurity dimensions indicate a slightly negative kurtosis, which reflects a flatter-than-normal distribution (Parasuraman 2000: 317), while the Optimism dimension has a positive kurtosis. The statistics for the four dimensions of TRI identified are reflected in Table 5.

Overall TRI was calculated by averaging the scores on the four components (after reverse coding the scores on the Discomfort and Insecurity components). The TRI score for urban consumers in South Africa (2.53) needs to be placed in context, which can be done by comparing it to the TRI score obtained by Parasuraman (2000) in an evaluation in the United States. In this study, the USA scored 2.88 on this instrument (Parasuraman 2000). This shows the difference between the two countries with respect to the readiness of citizens to adopt technological products.

Desirability of various technology-based banking products and services

The scale used in this section was an unlabelled 6-point scale, where 1 represented 'very undesirable', and 6 represented 'very desirable'. The statements with the highest means were "Let someone know via email or SMS that you have paid them" (mean = 4.87) and "View accounts and balances online" (mean = 4.84). The statement with the lowest mean (3.57) was "Purchase a large item like furniture via banking

Table 4: Descriptive statistics

Statement	Mean	Std deviation
Technology gives me more control of my daily life	4.16	1.107
Banking products and services that use the newest technologies are much more convenient to use	4.09	1.033
I like the idea of banking via computers because I am not limited to regular business hours	3.99	1.214
I prefer the use of the most advanced technology available	3.88	1.113
I like computer programs that allow me to tailor things to suit my needs	4.02	1.065
Technology makes me more efficient in my job	4.11	1.070
I find new technologies to be mentally stimulating	3.80	1.074
Technology gives me the freedom to move	3.92	1.053
Learning about technology can be as rewarding as the technology itself	3.85	1.036
I feel confident that machines will do what you tell them to do	3.55	1.112
Other people come to me for advice on new technologies	2.94	1.246
It seems my friends are learning more about the newest technologies than I am	3.08	1.163
In general, I am among the first in my circle of friends to acquire new technology when it appears	2.77	1.148
I can usually figure out new high-tech products and services without help from others	3.16	1.255
I keep up with the latest technological developments in my areas of interest	3.32	1.207
I enjoy the challenges of figuring out how high-tech gadgets work	3.24	1.286
I find I have fewer problems than other people in making technology work for me	3.29	1.122
Technical support (help) lines are not helpful because they do not explain things in terms I understand	3.07	1.138
Sometimes, I think that technology systems are not designed for use by ordinary people	3.05	1.199
There is no such thing as a manual for a high-tech product or service that is written in plain language	3.11	1.175
When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do	2.85	1.175
If I buy a high-tech product or service, I prefer to have the basic model rather than one with a lot of extra features	2.89	1.346
It is embarrassing when I have trouble with a high-tech gadget while people are watching	3.10	1.245
When replacing important people-tasks with technology, organisations must be careful, as new technology can break down or get disconnected	3.72	1.069
Many new technologies have health or safety risks that are not discovered until after people have used them	3.37	1.087
New technology makes it too easy for governments and companies to spy on people	3.67	1.133
Technology always seems to fail at the worst possible time	3.71	1.121

continued

Table 4 continued

Statement	Mean	Std deviation
I do not think it is safe to give out a credit card number over a computer	3.89	1.240
I do not think it is safe to do any kind of financial business online	3.12	1.319
I worry that information I send over the Internet will be seen by other people	3.54	1.207
I do not feel confident transacting with a place (an organisation) that can only be reached online	3.68	1.200
Any banking transaction you do electronically should be confirmed later with something in writing	3.97	1.173
Whenever something gets automated, you need to check carefully that the machine or computer is not making mistakes	3.91	1.086
The human touch is very important when banking	3.82	1.201
When I call a bank, I prefer to talk to a person rather than a machine	4.39	0.975
If I provide information to a machine or over the internet, I am never sure it really gets to the right place	3.58	1.216

Table 5: Summary of the TRI dimensions

Dimension	Mean	Standard deviation
Optimism	3.99	0.78591
Innovativeness	3.12	0.96506
Discomfort	3.26	0.70925
Insecurity	3.74	0.79703
Overall TRI	2.53	0.57040

reward schemes". There was only one other statement with a mean less than 4, enquiring whether the respondent would "Apply for banking products and services via cellphone" (3.74). The findings are presented in Table 6.

TRI and the ownership of technology-based banking products and services

The one-way ANOVA was used to determine whether significant differences exist between the TRI scores of at least two of the groups with regard to their ownership of various technology-based products and services, specifically in the area of banking products. The post hoc tests, Dunnet's T3 and Scheffé, indicate where the differences exist. The responses were analysed based on the banking products and services that are currently owned, those that the respondents plan to obtain and those that they have no plans to acquire. Table 7 shows the results.

Table 6: The desirability of various technology-based banking products and services

Activities	Mean	Std deviation
Make online banking payments and transfers	4.47	1.566
View accounts and balances online	**4.84**	1.421
View and download banking account statements online	4.77	1.455
Purchase small items like tickets to events via banking reward schemes	4.50	1.456
Purchase a large item like furniture via banking reward schemes	**3.57**	1.584
Apply for banking products and services online	4.00	1.560
File your tax return online	4.15	1.656
Buy prepaid phone airtime or electricity via cellphone banking	4.51	1.555
Make cellphone banking payments and transfers	4.05	1.603
View accounts and balances via cellphone	4.38	1.563
Let someone know via email or SMS that you have paid them	**4.87**	1.372
View and download banking account statements via cellphone	4.18	1.571
Apply for banking products and services via cellphone	**3.74**	1.619

From the analysis, significant differences in the TRI scores with respect to the ownership of the following technology-based banking products exist between the groups, as specified below:

- Bank account ($p = 0.010$). Respondents who currently have a bank account have a significantly higher TRI score than those who have no plans to get a bank account.
- Credit card ($p = 0.000$). Respondents who currently have, or and plan to have, credit cards in the next 12 months have a significantly higher TRI score than those who have no plans to obtain a credit card.
- Cellphone ($p = 0.001$). Respondents who currently have a cellphone have a significantly higher TRI score than those who have no plans to acquire a cellphone. Very few respondents, however, do not own cellphones.
- Internet access (via a landline) ($p = 0.000$). Respondents who have internet access via a landline have a significantly higher TRI than those who plan to get this product in the next 12 months, and those who have no plans to get internet access via a landline.

- Internet access (broadband) ($p = 0.000$). Respondents who have access to the internet through broadband have a significantly higher TRI score than those who plan to get internet access through broadband in the next 12 months, and those who have no plans to get internet access through broadband. The TRI score for those who plan to get internet access through broadband in the next 12 months is also significantly higher than for those who have no plans to get internet access through broadband.
- Wireless handheld device ($p = 0.000$). Respondents who currently have a wireless device have a significantly higher TRI score than those who plan to get a wireless handheld device in the next 12 months, and those who have no plans to get such a device. The TRI score for those who plan to get a handheld device in the next 12 months is also significantly higher than for those who have no plans to get this product.

Table 7: TRI and the ownership of technology-based banking products and services

Technology-based banking products and services	Currently have	Plan to have in the next 12months	Have no plans to get	Level of sig.
Bank account	2.53	2.41	2.28	0.010
Credit card	2.59	2.59	2.39	0.000
Cellphone	2.53	2.37	2.16	0.001
Landline telephone access	2.53	2.55	2.50	0.551
Internet access (landline)	2.57	2.52	2.43	0.000
Internet access (broadband)	2.68	2.58	2.27	0.000
Wireless handheld device (i.e. Blackberry)	2.85	2.70	2.42	0.000

Note: The mean scores are the TRI scores among each of these groups. Level of significance indicates a 5% level of significance.

TRI and the use of technology-based banking products and services

The results were used to determine whether significant differences exist between the TRI scores of different groups with regard to their usage of technology-based products and services.

The one-way ANOVA was used to determine whether TRI scores are significantly different between groups based upon the banking products and services that are

currently used, those that the respondents plans to use, and those that they have no plans to use. The post hoc tests, Dunnet's T3 and Scheffé, indicate where the differences exist. Table 8 presents the results.

From the analysis, it is evident that significant differences exist between at least two of the groups with regard to their TRI in as far as the following technology-based banking products are concerned:

- ATM banking ($p = 0.000$). Respondents who currently use and those who plan to use ATM banking in the next 12 months have a significantly higher TRI score than those who have no plans to use ATM banking.
- Cellphone banking ($p = 0.000$). Respondents who currently use cellphone banking have a significantly higher TRI score than those who plan to use cellphone banking in the next 12 months, and those who have no plans to use cellphone banking. The TRI score for those who plan to use cellphone banking in the next 12 months is also significantly higher than for those who have no plans to use cellphone banking.
- Landline telephone banking ($p = 0.009$). Respondents who currently use landline telephone banking have a significantly higher TRI score than those who plan to use landline telephone banking in the next 12 months, and those who have no plans to use landline telephone banking. The TRI score for those who plan to use landline telephone banking in the next 12 months is also significantly higher than for those who have no plans to use landline telephone banking.
- Internet banking ($p = 0.000$). Respondents who currently use internet banking have a significantly higher TRI score than those who plan to use internet banking in the next 12 months, and those who have no plans to use internet banking. The TRI score for those who plan to use internet banking in the next 12 months is also significantly higher than for those who have no plans to use internet banking.
- SARS eFiling ($p = 0.000$). Respondents who currently use SARS eFiling have a significantly higher TRI score than those who plan to use SARS eFiling in the next 12 months, and those who have no plans to use SARS eFiling. The TRI score for those who plan to use SARS eFiling in the next 12 months is also significantly higher than for those who have no plans to use SARS eFiling.
- SMS or email banking notification ($p = 0.000$). Respondents who currently use SMS or email banking notification have a significantly higher TRI score than those who plan to use SMS or email banking notification in the next 12 months, and those who have no plans to use SMS or email banking notification. The TRI score for those who plan to use SMS or email banking notification in the next 12 months is also significantly higher than for those who have no plans to use SMS or email banking notification.

- Online shopping via banking reward schemes ($p = 0.000$). Respondents who currently use online shopping via banking reward schemes have a significantly higher TRI score than those who plan to use online shopping via banking reward schemes in the next 12 months, and those who have no plans to use online shopping via banking reward schemes. The TRI score for those who plan to use online shopping via banking reward schemes in the next 12 months is also significantly higher than for those who have no plans to use online shopping via banking reward schemes.

In all the analyses reflected in Table 8, the respondents who have used the product or service in the past 12 months have significantly higher TRI scores than those in the other categories. Those who plan to use the product or service in the next 12 months also have a significantly higher TRI score than respondents with no plans to use the product or service, except for ATM banking.

Table 8: Relationship between the TRI and using technology-based banking products and services

Technology-based banking services	Have used in the past 12 months	Plan to use in the next 12 months	No plans to use	Sig
ATM banking	2.55	2.52	2.27	0.000
Cellphone banking	2.77	2.60	2.38	0.000
Landline telephone banking	2.73	2.59	2.47	0.009
Internet banking	2.76	2.52	2.20	0.000
SARS eFiling (Internet tax return)	2.83	2.65	2.37	0.000
SMS or email banking notification	2.69	2.50	2.29	0.000
Online shopping via banking reward schemes	2.91	2.68	2.40	0.000

Note: The mean scores are the TRI scores among each of these groups. Significance is determined at a 95% confidence interval.

Hypothesis testing

This section reports on the findings in relation to the hypotheses formulated for the study.

Hypothesis 1

Hypothesis 1: Developing country data will yield the same four dimensions of technology readiness as established by Parasuraman (2000).

The results of the factor analysis (Maximum Likelihood model) extracted four factors using Varimax rotation. These four factors accounted for 51.743% of the responses received. Factor 1 accounts for 25.337% of the responses received, indicating the importance of this factor. Table 9 provides the details associated with the factors identified.

The factors that were generated are similar to those generated in the initial research conducted, even with the removal of certain statements (refer to the discussion on data analysis). Factor 1 contains the statements on Optimism and accounts for 25.337% of the responses, while Factor 3 contains the statements relating to Innovativeness. Factor 2 contains some of the statements on Discomfort and all the statements on Insecurity. Factor 4 contains the balance of the statements on Discomfort (these are reflected in Table 9). The complete factor analysis is contained in Annexure 1.

Use was made of Cronbach's alpha to determine the reliability of the factors. The Cronbach's alpha on each dimension is greater than the figure of 0.7 identified by Hair et al. (2006) as being acceptable. The Cronbach's alphas associated with each dimension are reflected in Table 9.

Table 9: Results of the factor analysis

Factor	% of variation	Cumulative %	Cronbach's alpha
1	25.337	25.337	0.892
2	13.712	39.049	0.884
3	6.962	46.010	0.737
4	5.733	51.743	0.828

From the statistical analysis conducted, four factors were identified that are similar, although not identical, to those identified by Parasuraman (2000). Based on the analysis, hypothesis 1 is supported.

Hypothesis 2

Hypothesis 2: Customers who currently have access to technology-based products and services are more technologically ready than those customers who currently have no access to technology-based products and services.

In order to determine whether a significant difference exists between those who currently have access to technology-based products and services and those who do not, the t-test for independent samples was used. In the research conducted, the term 'have (having) access' is regarded as currently having ownership of a specific product or service. Thus, in the analysis, it is indicated that ownership and access are the same, or similar. Access (usage) of 60% of the technologies currently available to banking customers was utilised as the cut-off point. This was done in order to ensure that the groups were similar in size for analysis. From the analysis, it can be seen that those who have access (or ownership) of more than 60% of technology-based products and services have a higher mean TRI score (2.636) than those with a lower ownership percentage (2.38) (refer to Table 10).

Table 10: Access and mean TRI score

Access	Frequency	Mean TRI score	Std deviation
Access to less than 60% of products and services	889	2.38	0.564
Access to more than 60% of products and services	1 035	2.636	0.560

The differences between these groups are statistically significant, as reflected in Table 11 ($p = 0.000$).

Table 11: Access to technology

	t	df	Sig (2-tailed)
TRI	-9.962	1 922	0.000

From this analysis, hypothesis 2 is supported.

Hypothesis 3

Hypothesis 3: Customers who currently use technology-based banking services are more technologically ready than those customers who do not currently use technology-based products and services.

In order to determine whether a significant difference exists between those who currently use technology-based products and services and those who do not, the t-test for independent samples was used. In the analysis of these responses, usage of 60% of the technologies currently available to banking customers was used as the cut-off point, as in hypothesis 2. From this analysis, it can be seen that the respondents who

had lower usage rates had a lower mean TRI score (2.44) than those who had a usage of more than 60% (2.91) (refer to Table 12).

Table 12: Usage and mean TRI scores

Usage	Frequency	Mean TRI score	Std deviation
Usage of less than 60% of products and services	353	2.44	0.555
Usage of more than 60% of products and services	1704	2.91	0.497

Analysis between the groups at the 95% confidence interval indicates that the groups exhibit statistically significant differences ($p = 0.000$), as reflected in Table 13.

Table 13: Statistical significance relating to product usage

	t	df	Sig (2-tailed)
TRI	–14.547	2 055	0.000

From this analysis, hypothesis 3 is supported.

Hypothesis 4

Hypothesis 4: Customers who have a higher perceived desirability of various technology-based services are more technologically ready than those customers who have a lower perceived desirability of various technology-based services.

In order to determine whether a significant difference exists between those who are technologically more ready and those who are not, the t-test for independent samples was used. This hypothesis examines the desirability of technology (on a 6-point scale, where 1 is 'very undesirable' and 6 is 'very desirable') and the effect on technological readiness. In this analysis, a cut-off score of 3.5 (on a 6-point scale) was used to differentiate between those who have a higher perceived desirability of technology-based services and those who do not. From Table 15 it can be seen that those who have a higher perceived desirability have a higher mean TRI score (2.636) than those who have a lower desirability score (2.151). Furthermore, the difference between these groups is statistically significantly ($p = 0.000$) (refer to Tables 14 and 15).

From this analysis, hypothesis 4 is supported.

Table 14: Desirability and average TRI score

Desire	Frequency	Mean TRI score	Std deviation
Lower (< 3.5)	478	2.151	0.597
Higher (> 3.5)	1 678	2.636	0.513

Table 15: Statistical significance relating to desirability

	t	df	Sig (2-tailed)
TRI	17.550	2 154	0.000

Discussion

The ownership of technological products indicates a move away from landlines to the ownership of cellphone technology. The research also shows the desire of the respondents to speak to another person, rather than to a machine. The overall TRI score of 2.53 among respondents is lower than the score of 2.88 obtained for respondents in the US (Parasuraman 2000).

The ownership of technologically based products and services indicates a potential ownership for a number of products and services. As regards the usage of technology-based products and services, internet banking has been used more widely in the past 12 months than telephone banking (either through cellphones or landlines). This provides a number of challenges for organisations involved in landline technologies. From a banking perspective, respondents indicated no intention to use telephone banking in any form. Should they use it, they indicated that they would require the services of a person (rather than a machine) in this interaction.

This research has a number of implications for banking services and the way in which these are presented to customers. These include:

- Revisiting business and marketing strategies. Organisations providing banking services should consider changing their business strategy and the associated marketing strategies in the marketing of these services. The adoption of services that require a high degree of technology readiness will be impacted by low levels of technology readiness among their customers. This presents the organisation with the challenge of making the technology user-friendly and not overly intimidating to encourage customers to adopt the technology.
- The development of new technology for use by banking clients. Currently, the TRI score for all respondents is 2.53 (compared with 2.88 in the USA). Conducting this research among a representative sample may indicate a TRI score that is lower

than 2.53. This means that banks would introduce technology for which the market is not ready, impacting on its adoption and long-term success. Technology that is developed needs to be accessible in order to encourage its being adopted.

- The adoption of current technology by customers. Banks have introduced technology that is currently being used by one or more sectors of their market. The speed and success of the adoption of this technology by a broader market segment will be impacted by the technology readiness of the broader market, specifically among the next adopter group of customers. This places responsibility on the banking industry to find ways to encourage the adoption of technology (beyond pricing alternatives).
- Training employees. Despite the use of technology, there is still a need to train employees to deal with customers via call centres where customers can interact with a person, rather than with technology. This is especially the case with incidences of service failure and service recovery, where the use of technology may not provide the customer with a feeling of 'being heard'. Training people in this situation will affect the perceptions of the customers of the service offered, as well as improving customer satisfaction and customer loyalty.

Limitations of the research

Use was made of a convenience sample, which has the implication of not reflecting the entire population under study. The study only surveyed respondents in one urban environment, namely the Gauteng province of South Africa. This situation impacts on the representativeness of the results. Moreover, respondents in this study (urban consumers in Gauteng) were better educated than the overall population in this developing country, which affects the mean TRI scores obtained. Furthermore, the respondents have a higher rate of employment than the population as a whole. These aspects associated with the respondents make it difficult to generalise the findings to the population as a whole.

Further research

As indicated in the limitations, a wider study throughout South African to include more rural areas is needed to determine whether this TRI score can be regarded as accurate across the developing country. It is planned to expand this study to other areas. It is also planned to conduct a follow-up study in order to compare the new results with those obtained in this study.

Conclusions

Technology readiness among consumers has been identified as being critical in the adoption of the latest technology, while also impacting on the access and ownership of technologically based products and services. In this quantitative study, the technology readiness of South Africans with regard to banking products was determined, and a TRI score of 2.53 was obtained. The implication of the TRI scores obtained indicates the varying levels of technology readiness in South Africa, and hence the ownership and desirability of owning various technology-based products and services. These findings indicate the challenges for organisations involved in this sector in their endeavour to encourage the adoption and use of technology, but they also indicate ways in which organisations can incorporate the TRI of their customers into their marketing strategies.

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Annexure 1: Factor analysis

Statement	Factor 1 Optimism	Factor 2 Insecurity	Factor 3 Innovative-ness	Factor 4 Discomfort
Technology gives me more control of my daily life	0.719			
Banking products and services that use the newest technologies are much more convenient to use	0.734			
I like the idea of banking via computers because I am not limited to regular business hours	0.713			
I prefer the use of the most advanced technology available	0.722			
I like computer programs that allow me to tailor things to suit my needs	0.719			
Technology makes me more efficient in my job	0.731			
I find new technologies to be mentally stimulating	0.658			
Technology gives me the freedom to move	0.725			
Learning about technology can be as rewarding as the technology itself	0.568			
When replacing important people-tasks with technology, organisations must be careful, as new technology can break down or get disconnected		0.478		
Many new technologies have health or safety risks that are not discovered until after people have used them		0.482		
Technology always seems to fail at the worst possible time		0.420		
I do not think it is safe to give out a credit card number over a computer		0.653		
I do not think it is safe to do any kind of financial business online		0.669		
I worry that information I send over the internet will be seen by other people		0.712		
I do not feel confident transacting with a place (an organisation) that can only be reached online		0.683		
Whenever something gets automated, you need to check carefully that the machine or computer is not making mistakes		0.608		
The human touch is very important when banking		0.638		

continued

Annexure 1 continued

Statement	Factor 1 Optimism	Factor 2 Insecurity	Factor 3 Innovative-ness	Factor 4 Discomfort
When I call a bank, I prefer to talk to a person rather than a machine		0.559		
If I provide information to a machine or over the internet, I am never sure it really gets to the right place		0.671		
Other people come to me for advice on new technologies			0.734	
In general, I am among the first in my circle of friends to acquire new technology when it appears			0.710	
I can usually figure out new high-tech products and services without help from others			0.778	
I keep up with the latest technological developments in my areas of interest			0.759	
I enjoy the challenges of figuring out how high-tech gadgets work			0.799	
I find I have fewer problems than other people in making technology work for me			0.743	
Technical support (help) lines are not helpful because they do not explain things in terms I understand				0.697
Sometimes, I think that technology systems are not designed for use by ordinary people				0.763
There is no such thing as a manual for a high-tech product or service that is written in plain language				0.755
When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do				0.622