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CONSUMER ACCEPTANCE OF ELECTRONIC PURSES AS A PAYMENT FOR LOW VALUE TRANSACTIONS

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CONSUMER ACCEPTANCE OF ELECTRONIC PURSES AS A PAYMENT FOR LOW VALUE TRANSACTIONS

A project report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Business Administration

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Johannesburg, 2002

ABSTRACT

The purpose of this research was to determine whether electronic purse (e-purse) schemes could be positioned as alternatives to existing payment methods for low value transactions. The focus was on low value transactions since it was widely believed that this was the area for which e-purse schemes were best suited.

The existing payment methods considered in this research included:

- Credit Cards
- Debit Cards
- Cheques
- Cash

Conjoint analysis was used to analyse the contribution made by various attributes associated with payment methods towards the overall perception of the payment methods by consumers.

It was determined that the cost of a transaction and the security the payment method offered against theft, were by far the most important requirements for the likely adoption of a payment method. This implied that PIN protected e-purse schemes were well suited for the low value transaction market.

DECLARATION

I, Sybren van der Leij declare that this project report is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

.....

16th day of August, 2002

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1 INTRODUCTION

The purpose of this research was to determine whether electronic purse (e-purse) schemes could be positioned as alternatives to existing payment methods for low value transactions. The focus was on low value transactions since it was widely believed that this was the area for which e-purse schemes were best suited.

The existing payment methods considered in this research included:

- Credit Cards
- Debit Cards
- Cheques
- Cash

1.1 Background

Retail banks in South Africa offer four methods of payment at present, namely credit cards, debit cards, cheques and cash. A fifth payment method, an e-purse, is offered by Nedbank ('Advantage Card') and First National Bank ('Bob 2000') and has enjoyed limited success. The failure of many e-purse schemes around the world prompted doubts over the feasibility and marketability of e-purse schemes in South Africa.

Debit cards too have enjoyed only a limited amount of success and cash remains the predominant form of payment for most South Africans. In an attempt to introduce electronic payment methods as an alternative to cash, South African banks have been negotiating with one another over the prospects of a national e-purse architecture.

At present, two major schools of thought exist over the type of e-purse scheme that should be implemented. The first proposes a scheme in which the funds stored on the smart card should be treated as electronic cash. The funds will not be protected by a personal identification number (PIN) and, should the card be lost or stolen, the remaining balance on the card will not be refundable. The advantages of this type of product include

- Faster transaction time at Point-of-Sale (POS) devices
- The smart card can be used in situations where PIN presentation is impractical or impossible such as payphones, public transport, vending machines and at toll plazas
- This method conforms to the Common Electronic Purse Standards (CEPS) that has been adopted by leading banks throughout Europe (The SmartEuro Project Partners, 2000)

The second school of thought proposes that funds on the card should be PIN protected. In this case, should the card be lost, the remaining balance

on the card can be refunded. The major advantage of this scheme is that it offers greater security for the cardholder.

1.2 Need for the research

There are many instances around the world where e-purse schemes have failed to grow past a pilot phase. One of the world's leading e-purse schemes, Mondex, has over 50 pilot projects world wide, none of which have progressed past the pilot stage (The SmartEuro Project Partners, 2000).

There are many reasons for these failures (Lefebvre, 1999) but the one most relevant to this research is the fact that consumers have simply failed to embrace the e-purse concept.

1.3 Scope of the research

At least 13 attributes associated with payment methods were identified in the literature review in section 2. Furthermore, existing research has shown that perceptions of payment methods change depending on the situations in which they are used (Ho and Ng, 1994; Hirschman, 1982).

It was beyond the scope of this research to determine the relative importance of all the identified attributes within all the various payment situations. Since the literature review revealed that e-purses were regarded

as potential alternatives for cash in low value transactions, situations were confined to low value purchases. An arbitrary cut-off value of R20 was chosen as the upper boundary for low-value transactions.

The research was restricted to what was termed "normal" or "middle of the month" situations. End-of-month situations in which consumers could be short of funds while waiting for salary payments could create a stronger motivation for the use of payment methods which offer leverage (credit cards) or delayed transfer times (cheques).

The research was confined to retail environments where all payment methods had an equal chance of being used. This meant that retail environments that did not accept electronic transactions or cheques were excluded.

Only payment methods offered by retail banks in South Africa were considered in this research. It was assumed that loyalty cards, retailer credit cards and club cards had unique attributes that motivated consumer use and thus fell outside of the scope of the research.

1.4 The research problem

The research problem was stated as follows:

"How will the contributions made by specific attributes associated with payment methods towards the overall perception held by consumers of the payment methods, contribute towards the most likely perception held by consumers of electronic purses?"

The research problem was divided into sub-problems that could be stated as follows:

1.4.1 What attributes need to be considered as providing major contributions towards consumer perceptions of the payment methods?

1.4.2 What are the levels of contribution made by each attribute towards the overall consumer perception of the payment methods?

1.4.3 Is there a perceived need for non-PIN protected electronic purses?

1.4.4 Is there a perceived need for PIN protected electronic purses?

1.5 Assumptions

1.5.1 An arbitrary value of R20 was assumed as a cut off point for low value transactions

1.5.2 Within the scope of the research, leverage was assumed to play a minimal part in determining a consumer's choice of payment method.

1.5.3 Most of the findings relating to payment method attributes came from research conducted on respondents from the United States, Great Britain and Hong Kong. It was assumed that these findings were relevant to the South African environment.

1.5.4 A few assumptions were made about the relevance and importance of certain attributes described in section 2.3. These assumptions were discussed throughout section 3 and were based partly on information obtained in the literature review and partly on observations made by the author.

1.6 Research limitations

This research was not intended to be a feasibility study for e-purse applications. It was merely focussing on low value transactions to determine if potential existed to position an e-purse scheme as an alternative to cash or other payment methods within the boundaries of this situation. This is only one area where e-purse applications can be used.

1.7 Structure of the research

The remainder of the project report can be divided into 5 sections. The first, section 2, contains a review of published literature which helped to determine what attributes were relevant to consumer perceptions of payment systems as well as to determine how to measure them. Three propositions were stated at the end of section 2.

Section 3 contains a motivation of the use of conjoint analysis as the research tool and contains a description of how it was used. The results of the conjoint analysis, as well as some additional tests on the validity of certain assumptions made in section 3 are contained in section 4.

Section 5 contains interpretations of the research findings and how they relate to findings obtained in the literature review. A brief summary, recommendations on how the research findings can be used in the implementation of e-purse schemes and recommendations for further research are included in section 6.

2 LITERATURE REVIEW

2.1 Background

Greenspan (1996) noted that modern payment methods are nothing more than minor variations of two basic themes - cash and a deposit balance held at deposit institutions. His observation implied that new payment methods could be viewed as technological advancements on existing banking concepts. Payment methods such as credit cards, debit cards and cheques can be viewed as instruments for transferring deposit money or claims from one deposit institution account to another.

There are many strategic reasons for implementing electronic funds transfer systems and for continually improving existing payment methods. Greenspan (1996) noted that electronic funds transfer systems reduced the transaction time required for payments as well as processing costs. He also noted that innovations in payment methods have also been aimed at minimising the cost of banking regulations such as reserve requirements and limits on the payment of interest on deposits.

A similar view on cost reduction was taken by Lefebvre (1999) who estimated that cash handling costs incurred by banks ranged between 5% and 7% of the total transaction value. These percentages have led to an estimated cash handling cost of US$30 billion per year to banks worldwide.

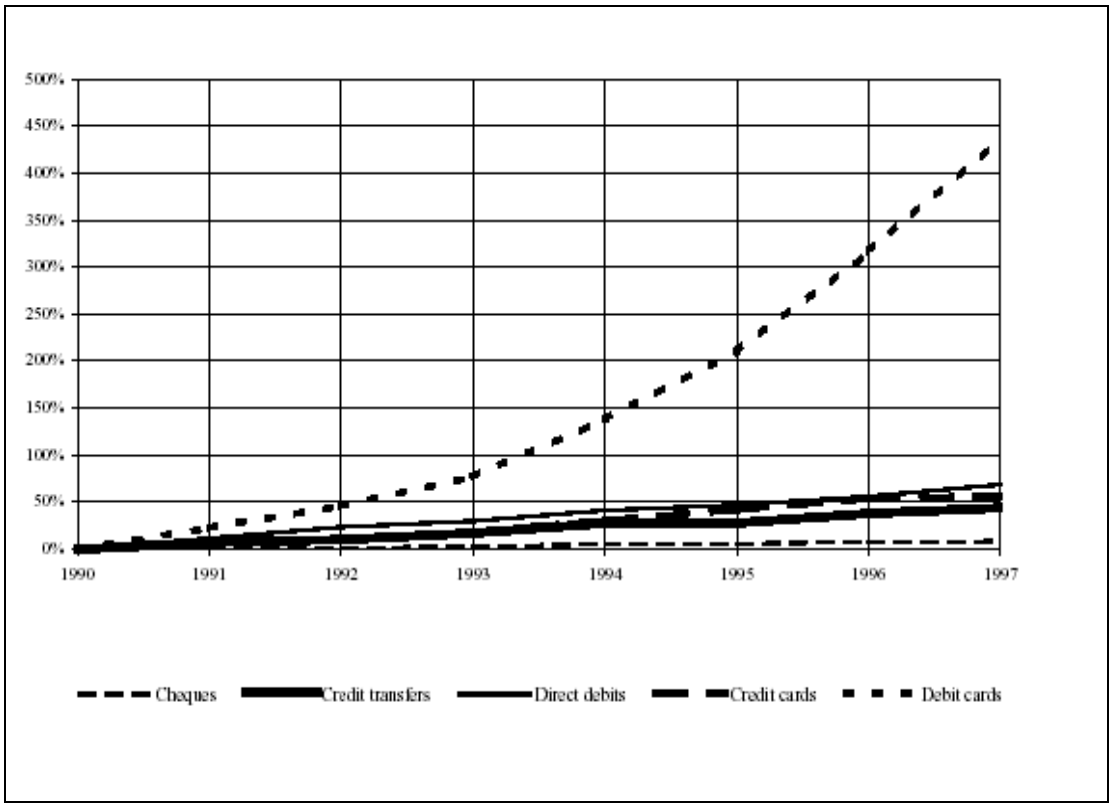
Electronic funds transfer systems also create the potential for additional revenue streams for issuing institutions and provide opportunities to improve customer relationships (Lunt, 1996). The SmartEuro Project Partners (2000) identified additional revenue streams such as floats, transaction fees, card issuing fees and POS device rental fees.

2.1.1 Cash

What is evident from the innovations in payment methods is that retail banks throughout the world are striving to reduce consumers' use of cash as a payment instrument. The continued increase in the use of non-cash payments in the Group of 10 (G10) Nations is shown in Figure 1.

However, despite this increase of electronic and paper based payment methods, cash is still the most widely used payment method worldwide (Humphrey, Pulley and Vesala, 1996). Unfortunately, there is very little available data relating to total cash transactions but two useful indirect measures of cash use, namely the per capita holdings of cash and the currency payments to gross domestic product (GDP) ratio can be used to help confirm this observation (Humphrey *et al*, 1994).

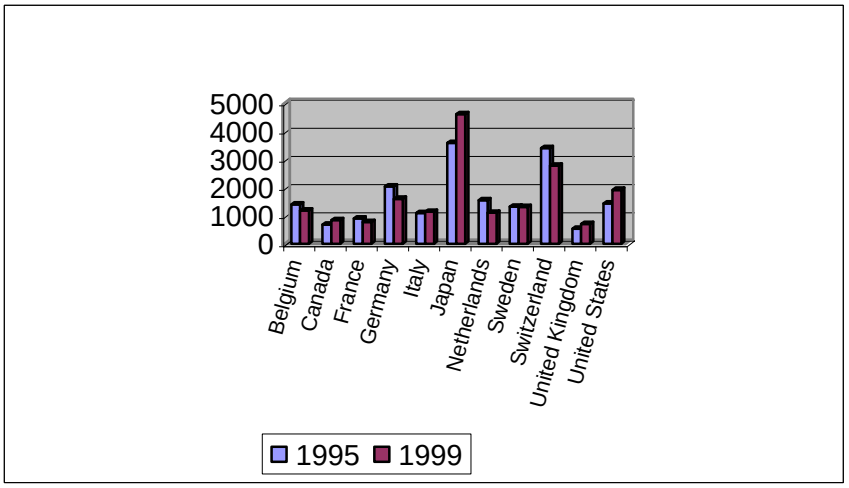
Figure 1. Aggregate growth rate of non-cash payment volume. G10 and Australia



Source: Adapted from Bank for International Settlements (1999b)

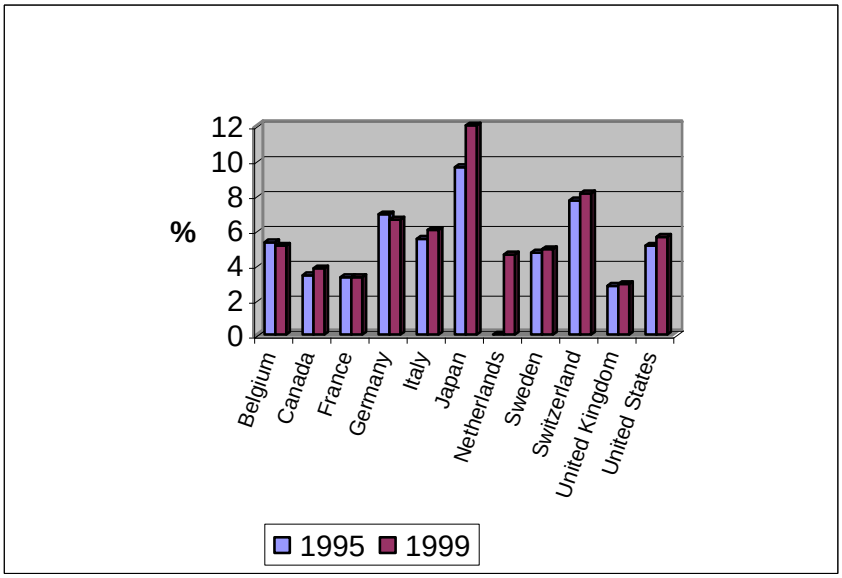
Figures 2 and 3 show the change in cash holdings and the currency payments to GDP ratios for the eleven industrialised nations in the G10 nations between 1995 and 1999. What is evident from these figures is that, despite the growth in non-cash payment methods highlighted in figure 1, cash holdings and the currency payments to GDP ratio's have remained more or less constant (Bank for International Settlements, 1999b; Humphrey *et al,* 1994). Similar findings for South Africa have indicated an 8% increase in the currency payments to GDP ratio (Bank for International Settlements, 1999a).

Figure 2. Cash holdings per capita (US$)



Source: Adapted from Bank for International Settlements (2001)

Figure 3. Currency payments as percentage of GDP



Source: Adapted from Bank for International Settlements (2001)

2.1.3 Electronic purses

There have been many debates around the merits and possibility of a "cash-free society" and the role that e-purses can play in replacing cash transactions. Lefebvre (1999:243) pointed out that "For most analysts, digital money is synonymous with electronic purse systems for small amount transactions". Stuber (1996) noted that smart card technology has made the possibility of an electronic replacement for cash feasible.

An essential tool in all e-purse schemes is the smart card. Smart cards are plastic cards the size of a credit card in which a processing chip has been embedded. Smart card chips have various levels of processing power. At the bottom of the scale are memory cards. These cards have very limited processing capability and are typically used as disposable prepaid cards such as telephone cards. Microprocessor chips, on the other hand, are capable of performing more advanced arithmetic logic and can thus perform more complicated functions such as cryptography and certain mathematical equations used in financial transactions.

One of the most powerful features of smart cards is the high level of hardware security that they offer. The information stored on the smart cards is protected by sophisticated security mechanisms that make fraudulent attempts to read or modify this information extremely difficult.

The basic architecture of all e-purse schemes involves pre-loading funds onto a consumer's smart card. At the same time, the deposit-taking institution would have to guarantee the funds on the smart card by withholding or debiting the value loaded onto the card from the consumer's account. Alternatively, if the consumer paid cash for the value loaded onto the smart card, the funds would be deposited into a reserved account.

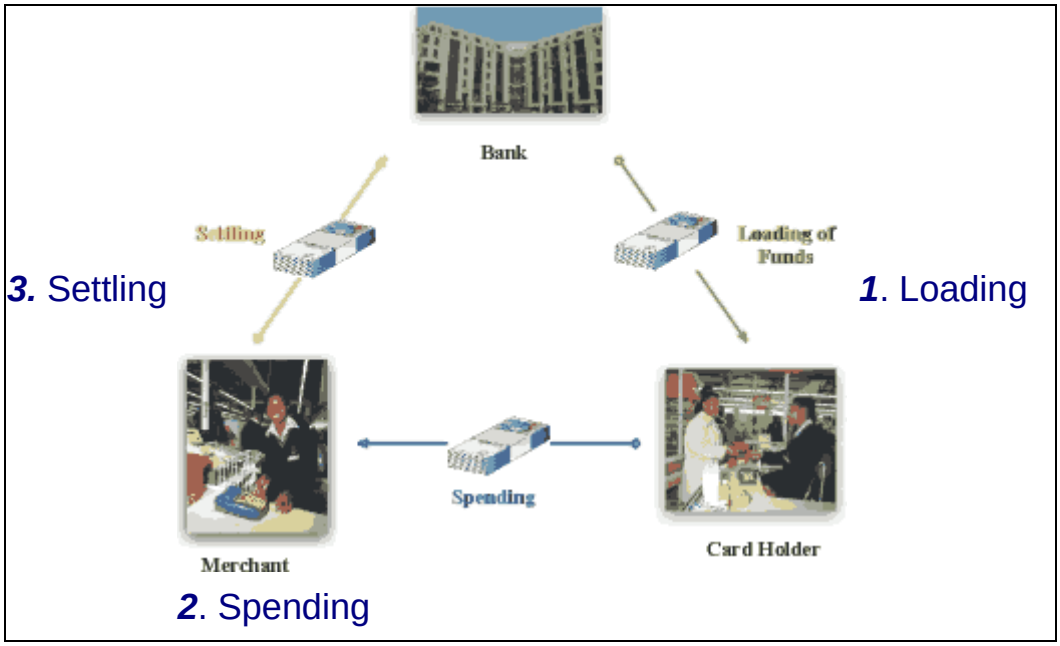
The consumer could then spend the funds on the card at any merchant who is in possession of a POS device loaded with the e-purse scheme's software. Typically, funds are debited from the consumer's smart card and transferred to a security module or another smart card situated in the POS device.

A unique feature of e-purse schemes is that this transaction can be performed without the need for an on-line connection to a mainframe computer to verify the consumer's account details or personal identification number. This can reduce transaction costs since online communications usually make use of communication infrastructures such as telephone lines or cellular networks that charge for each call. Another benefit offered by this feature is that transactions can occur in under-developed areas where communication infrastructure is poor or non-existent. Transactions are also not affected by overloaded networks or by communication network failures.

In order for the merchant to redeem the value collected in the security module, the transaction information needs to be sent to the deposit-taking

institution's mainframe computer. This process is referred to as 'settlement'. At this point, the reserved account is debited by the total transaction value (alternatively, the transaction value of each individual transaction is debited from the corresponding consumer's account) and transferred to the merchant's nominated account.

Figure 4. Electronic purse overview



Source: Aplitec website (2002)

The SmartEuro Project Partners (2000) distinguish between accountable and non-accountable e-purse systems. The distinction defines the extent to which transactions are centrally monitored and controlled. It also defines the extent to which audit trails for each transaction are kept.

A similar distinction was made by Stuber (1996:6) who described fully accountable systems as "offline debit cards" and contrasts them to non-

accountable systems that "share physical currency's characteristic of anonymity; they would be an even closer substitute for cash."

A further distinction needs to be made between e-purse schemes that require PIN protection for sales transactions and those that don't. The SmartEuro Project Partners (2000) highlighted several schemes including Proton in Belgium, Geldkarte in Germany and CEPS that do not require PIN presentation for sales. The SAIB standards in South Africa are an example of a scheme that requires PIN protection for sales. E-purse systems that offer PIN protection for sales and that are fully auditable, also have the ability to refund the remaining balance on the smart card should the card be lost or stolen. The SAIB standards are an example of such a system.

From a retail merchant's perspective, e-purse schemes function more like debit cards or 'electronic cheques' rather than cash. This is because the transaction value collected has to be redeemed by the card issuing institution. This research is more concerned with the consumer's perspective. From this perspective, the major differences between debit cards, cash and e-purse can be summarised in table 1.

Table 1. Major differences between debit cards, cash and e-purse

Debit Cards	**Cash**	**E-purse**
Funds remain in account	Funds are withdrawn from account	Funds are withdrawn from account and loaded onto smart card
Funds are PIN or signature protected	No PIN protection	PIN protection of funds is optional
Use is restricted to merchants with POS devices	No restrictions	Use is restricted to merchants with POS devices
Funds can be protected if card is lost	Funds cannot be refunded if lost	Funds can be refunded if card is lost (PIN protection only).

2.2 The diffusion of innovations framework

"It matters little whether or not an innovation has a great degree of advantage over the idea it is replacing. What does matter is whether the individual perceives the relative advantage of the innovation." (Rogers, 1962: 124)

A useful concept for analysing consumer acceptance of technological advances in payment methods is the "diffusion of innovations" framework. Within this framework, Rogers (1962) defined 5 different characteristics of innovations. Consumer perceptions of these characteristics would affect the rate of adoption of the innovation. These characteristics were summarised by Blackwell, Miniard and Engel (2001) as follows:

1) Relative advantage

Blackwell *et al* (2001) identified this as being the most important factor for evaluating an innovation's potential success. It refers to the degree to which consumers may perceive an innovation as offering greater benefits than existing innovations.

2) Compatibility

This refers to the degree to which a new innovation is consistent with an individual's existing practises, values, needs and past experiences. For example, debit cards function in similar ways to cheques in the manner in which an individual's account is debited. They also function similar to credit cards since they have to be swiped at a POS device. The PIN presentation routine required by debit cards is also not new to consumers.

3) Complexity

The more difficult an innovation is to use, the less its chance of adoption will be.

4) Trialability

New innovations are more likely to be adopted by consumers if they can experiment with the concept on a trial basis with minimal financial risk.

5) Observability (also referred to as communicability)

If consumers can see others benefiting from the use of an innovation, then the innovation will have a greater chance of being adopted.

Antonides and Amesz (1999) found that the diffusion of innovations theory could be used to explain the increase in adoption rates of various electronic payment methods. They concluded that the introduction of the smart card into electronic banking was likely to experience a higher rate of adoption than preceding electronic payment methods.

If a product is to effectively replace cash, it needs to be perceived as offering greater benefits than cash. Bourne and Szmigin (1999) analysed consumer perceptions of a specific e-purse pilot scheme (Mondex) within a "diffusion of innovations" framework. They found that the scheme was unlikely to be perceived as offering real advantages over cash except in specific applications such as vending machines public transport.

Bourne and Szmigin's (1999) research identified unique attributes associated with cash that were crucial to its adoption and use by consumers. Hirschman (1982) confirmed this by identifying several dimensions along which the performances of payment methods were perceived to differ. Hirschman's study also found evidence suggesting that consumer perceptions of payment methods affected their preference for and usage of alternative payment methods.

2.3 Attributes associated with payment methods

A review of published literature helped to identify the following attributes that are associated with various payment methods.

2.3.1 Budgeting

Budgeting refers to the payment method's ability to help with budgeting and planning expenditures. Bourne and Szmigin (1999) found that this attribute played a significant role in blocking the adoption of an e-purse scheme by college students. Students were always able to determine how much cash they had on-hand while the available balance on their smart card could only be determined by an electronic reader.

Cash was also perceived to have greater budgeting ability than credit cards, however, there does not appear to be much evidence indicating that this attribute actually influences the use of cash (Hirschman, 1982).

Hirschman (1982) found that credit cards were perceived to offer low budgeting ability and that this and the lower ability to control spending contributed negatively towards consumer preference for and use of credit cards. However, Foxall and Szmigin (1999) identified a segment of consumers they called "Controllers" who had different perceptions to those described by Hirschman. "Controllers" were particularly concerned about monthly budgets and tended to use a single payment method to facilitate

control. Although credit cards were usually the favoured payment method (in which case payment was usually made before interest charges are incurred), other payment methods, particularly cash, could also be used.

This attribute appeared to play a significant role in influencing consumers to use cheques (Hirschman, 1982).

The most effective way to measure this attribute would be to describe the manner in which a consumer can determine the available balance on a card or account or the available level of credit left. Although budget ability refers to a concept a little more complex than simply determining an available balance, knowing how much you have to spend is an essential aspect of controlling a budget.

2.3.2 Transaction receipts

The significance of this attribute is that consumers can verify that they have been debited for the correct amount. Failure to provide such functionality can impede the use of certain payment methods (Bourne and Szmigin, 1999).

2.3.3 Reversibility

This attribute refers to the extent to which a payment method provides the ability to reverse a transaction made at a POS device.

2.3.4 Transaction records

Most payment methods offer a physical record of each transaction made. Certain electronic purse schemes store this functionality on the smart card and thus enable the consumer to obtain a printout of the last few transactions at a POS device.

2.3.5 Acceptability

This attribute is a fundamental reason for the widespread use of cash as opposed to all other payment methods. Hirschman (1982) observed that the acceptance of a payment method at retail outlets is a factor not controllable by a consumer and that such factors result in a lack of congruence between the relationships of perceived attributes of products to their actual usage and preference. This could, for instance, help explain why cash is widely used despite the security concerns associated with cash (which are analysed in section 2.3.6).

There are certain situations where cash might not be accepted. These include vending machines, card based public telephones and in certain public transport applications. Strategically, these situations provide opportunities to launch electronic payment applications such as electronic purses without needing to create widespread acceptance of the application (Lefebvre, 1999).

2.3.6 Security

Security, in the context of this research, related specifically to theft and loss of funds. Ho and Ng (1994) identified two dimensions to security in this context (collectively referred to as "physical risk"). The first was a perceived risk that payment methods could increase the chances of theft, which could result in personal injury. The second was the perceived risk of financial loss in the event of theft or loss of cards/cash. They found that the levels "physical risk" ranked the highest out of all levels of perceived risk for cash and ranked second lowest for credit card payments and lowest for debit card payments.

Hirschman's (1982) findings regarding perceived levels of security supported Ng and Ho's (1994) findings since her findings indicated that cash was perceived to offer less security than credit cards and that this negatively affected the use of cash.

Kara, Kaynak and Kucukemiroglu (1994) found a difference in credit card preferences between male and female students. One possible explanation put forward by them was that females were choosing credit cards that were "conceived as being more secure" (Kara *et al,* 1994:35).

2.3.7 Leverage potential

The ability to borrow money is a major selling point for credit card manufacturers and it is clear that this attribute cannot be ignored when comparing motivations for the use of payment methods.

In the U.S., the holding of a credit card with a revolving credit feature had increased from 2% of lower income households in 1970 to 38% in 1998 and from 33% of upper income households to 95% in 1995. (Durkin, 2000).

Kara *et al* (1994) found that payment type (deferred monthly payments as opposed to once of lump-sum payments) was one of the most important attributes associated with credit cards by students.

2.3.8 Transaction time

Ho and Ng (1994) and Hirschman (1982) concluded that the speed with which a transaction is conducted is relevant to a consumer's perception of a payment method. Cash is perceived to be the real winner in this regard.

An observation made from Bourne and Szmigin's (1999) study was that transaction time could also include an element of convenience. E-purses, for instance, do not require any signatures or the counting out of change. Many respondents in their study regarded the e-purse scheme as relatively 'hassle free' in this regard.

2.3.9 Prestige

The self-image of a consumer could be affected by the payment method used but the relative importance of this attribute, when compared to other attributes appears to be fairly low (Ho and Ng, 1994).

Kara *et al* (1994) demonstrated that the card type (gold, classic or platinum) which are traditionally marketed with varying levels of prestige, were the least differentiating factors in credit card choice among students.

2.3.10 Transfer time

This attribute refers to the time taken before the funds spent are actually transferred from the consumer's account to the merchant's account. It is not to be confused with leverage potential since it does not refer to an ability to borrow funds. An example of the significance of transfer time is a post-dated cheque or a cheque payment that is made with the knowledge that the cheque will only be deposited after funds become available in the consumer's account.

Foxall and Szmigin (1999) identified a segment of consumers ("Finessers") who regarded this attribute as fairly essential.

2.3.11 Performance

This attribute refers to the number of times a transaction fails due to communication problems or rejection by the deposit taking institution. Ho and Ng (1994) concluded that this was the highest level of perceived risk for credit card and debit card use although they included instances where retailers did not accept these payment methods or charged extra for their use as part of the definition of this type of perceived risk.

2.3.12 Complexity

The ease of use of a product will affect the speed with which it is adopted by a community (Rogers, 1962). Credit cards, cheques and debit cards have been around for some time and it is plausible to assume that the use of these products is fully understood by consumers. Individuals who are new to these products may have trouble learning how to use them, but the general community has adopted the basic concepts of these products.

E- purses may not be perceived as being as easy to use as other bank products. This is primarily due to the fact that they need to be loaded with funds before they can be used. Bourne and Szmigin (1999) did identify this as a factor affecting adoption of an e-purse scheme, particularly since the load procedure (which, in their case, could be performed at ATM machines) was more complicated than the ATM functions consumers were used to.

Another area of concern around loading funds onto e-purse schemes was that this function (within the context of a retail environment) is unique to e-purse schemes. In fact, electronic payment methods can be classified as 'pay later', 'pay now' or 'pay before' schemes (Worthington, 1995). Credit cards and debit cards fit into the first two categories respectively. The latter category includes prepaid vending applications and e-purses. While consumers are likely to be familiar with prepaid vending applications, the merits of a preloaded e-purse to be used in a retail environment may be a completely unique concept to consumers. Rogers (1962) argued that consumers would more readily adopt new innovations that were compatible with existing usage patterns (see section 2.2.2).

Credit cards also have their fair share of complexity. While over 80% of US consumers are aware of credit card interest rate charges, close to 35% of them don't pay their outstanding balances in time to prevent incurring interest charges (Durkin, 2000). This implied that many consumers have not considered using credit cards as a cheap method of payment for low value transactions.

2.3.13 Transaction cost

Foxall and Szmigin's (1999) research suggested that clearly defined segments exist in which consumers' attitudes towards cost completely differ. On the one hand, they found consumers who were prepared to

utilise payment methods in order to maximise the benefits offered, despite incurring extra transaction costs. On the other extreme, they found consumers ("Finessers") who would attempt to maximise interest free periods or minimise transaction costs.

2.4 Relative importance of attributes

Section 2.2.1 identified the concept of 'relative advantage' as being the most important factor in determining whether a new innovation will be adopted or not. An important observation that needs to be made is that it is not the actual advantage that an innovation offers over existing innovations that matters. It is the perceived advantage that really affects the rate of adoption (Rogers, 1962). Based on this observation, the relative importance of the attributes identified in section 2.3 could be useful in determining whether a new product, consisting of different combinations of the attributes, is likely to be perceived as offering relative advantage.

Within the literature reviewed, some attempt was made to determine the relative importance of the various attributes identified. Ho and Ng (1994) managed to sort the relative importance of five dimensions of risk perception into a hierarchy with the aid of matched pair t-tests. Unfortunately, their study only measured perceptions of existing products and did not offer any insight as to consumer preferences for the products.

Hirschman (1982) made use of multiple regression to determine the impact of attributes on the use of and preference for various payment methods. The regression co-efficient for each attribute could be used to determine if the attribute had a positive or negative effect on usage or preference and the size of the coefficient gave an indication of the strength of the relationship between the attribute, usage and preference (Lind, Marchal and Mason, 2000).

Any attempt to determine the relative importance of attributes based on the size of the regression coefficients in Hirschman's (1982) study needed to be treated with care. The regression coefficients were measured based on an individual's response to a specific question relating purely to that attribute (Likert scales were used).

This posed two problems. Firstly, there did not appear to be any major significant difference between many of the regression coefficients. This is a documented problem with Likert scales (Aaker and Day, 1990).

Secondly, respondents were not asked to consider any trade-offs in attributes. For example, both security and transaction time had moderately strong positive impacts on credit card use. The regression coefficients could not be used to determine what the impact would be if transaction time was traded off to increase security.

The study done by Kara *et al* (1994) demonstrated the power of determining the relative importance of attributes associated with credit cards. They noted that it was impossible to create a credit card product that contained all the favourable attributes used in their study. However, by understanding that the interest rate and type of credit card (deferred monthly payments as opposed to lump sum payments) were by far the most important attributes to the population in question, the implications of trade-offs in these attributes could be better understood.

2.5 Market segmentation

Kotler (2000: 256) defined a market segment as consisting of "… a large identifiable group within a market with similar wants, purchasing power, geographical location, buying attitudes or buying habits." There are many ways in which to segment a market. These can be divided into 2 categories: *consumer characteristics such* as geographic, demographic and psychographic profiles and *consumer responses* such as benefits sought or use occasions (Kotler, 2000). It is the latter that is of relevance to this research.

The four segments of consumers identified by Foxall and Szmigin (1999) each demonstrated specific needs for various payment methods. The significance of this aspect of their research is that it demonstrates that consumers have different opinions towards the relevant importance of various attributes associated with payment methods.

2.6 Payment situations

Consumer perceptions of payment methods could change depending on the size of the transaction (Ho and Ng, 1994). The actual preference for and use of payment methods can also change depending on the size of the transaction and the type of purchase situation for example a major shopping outing versus an average day shopping outing or an out of town holiday or business shopping situation (Hirschman, 1982).

2.7 Propositions

2.7.1 Proposition 1

Within low-value payment situations, there exists a hierarchy of preference by consumers for payment method attributes.

This proposition stemmed from the findings of Hirschman (1982), Ho and Ng (1994) and Kara *et al* (1994). Their findings were discussed in detail in section 2.4.

2.7.2 Proposition 2

Within the specific retail situations defined in the scope of this research, the relative advantage offered by non-PIN protected electronic payment methods over existing payment methods could help them obtain the majority share of the market for low value transactions.

This proposition was based largely on the conclusions of Bourne and Szmigin's (1999) research.

2.7.3 Proposition 3

Within the specific retail situations defined in the scope of this research, the relative advantage offered by PIN protected electronic payment methods over existing payment methods could help them obtain the majority share of the market for low value transactions.

This proposition was designed to test whether consumers were likely to perceive the additional security offered by PIN protected e-purse schemes as being sufficient to overcome the shortfalls that they might have in the other attributes mentioned in section 2.3.

2.8 Conclusion

The purpose of this research was to determine whether e-purse schemes could be positioned as an alternative to existing payment methods for low value transactions. E-purse schemes were divided into PIN protected and non-PIN protected schemes.

The payment methods in question were analysed in the literature review and several unique characteristics that could be associated with each were identified. The literature review also identified several attributes that contributed towards a consumer's overall perception of a payment method.

The diffusion of innovations framework (Rogers, 1962) provided a useful guideline for analysing the relevant payment method attributes. This framework identified a concept of relative advantage that was regarded as being crucial to the rate at which a new product such as an e-purse was likely to be adopted. The relative importance of the attributes was identified as a useful indication of the relative advantage that a new product can offer. This finding led to the formation of proposition 1.

Research done by Bourne and Szmigin (1999) found that non-PIN protected e-purse schemes were unlikely to be adopted by consumers as a replacement for cash since they were perceived as being more complicated and had less 'budget ability'. The latter refers to the consumer's ability to determine available balances on the card.

However, Bourne and Szmigin's (1999) research did suggest that consumers' opinions differed in terms of the level of convenience offered by the e-purse scheme. This observation could be used, in conjunction with Foxall and Szmigin's (1999) findings that a segment of consumers existed that clearly identified with the tangible benefits offered by a payment method (in this case, a non-PIN protected e-purse), in the formation of proposition 2.

The greatest advantage that PIN protected e-purses offer over cash is increased security. Unfortunately, Hirschman (1982) and Ho and Ng (1994) found that the perceived risk of cash increased as the transaction size increased. Since this research was concerned with low-value transactions, the true value of the increased security offered by PIN protected e-purses remained in doubt.

Another point regarding security was that credit cards, cheques and debit cards also offer increased levels of security over cash (Ho and Ng, 1994, Hirschman, 1982). This placed all three payment methods in direct competition with PIN protected e-purses.

These observations placed serious doubts over the likely acceptance of e-purse schemes. Proposition 3 was designed to test if these doubts were valid.

There are other tangible benefits offered by both PIN-protected and non-PIN protected e-purse schemes that could help these products offer relative advantage over existing payment methods. Unfortunately, these benefits result in trade-offs with other attributes. For example, e-purses might offer greater transaction speed than credit cards since no on-line communications are required, but this has to be traded for the extra complexity involved in pre-loading e-purses with funds.

These trade-offs needed to be considered in order to determine if consumers would perceive any product as offering a relative advantage over another.

3 RESEARCH METHODOLOGY

The purpose of this research was to determine whether e-purse schemes can be positioned as an alternative to existing payment methods for low value transactions. Conjoint analysis was used to determine the levels of contribution made by the attributes defined in section 2.3.

This section explains the motivations for using conjoint analysis as well as the limitations of the technique. A detailed description of the purpose of each question included in the research questionnaire is also given.

3.1 Conjoint analysis

Conjoint analysis is defined as "… a multivariate technique used specifically to understand how respondents develop preferences for products or services" (Anderson, Black, Hair and Tatham, 1994: 360). It provides a quantitative measure of the relative importance of one attribute over another by allowing the researcher to construct real or hypothetical products by combining various levels of each attribute and then asking a respondent to supply an overall evaluation. (An attribute level is a specific value of an attribute. For example the attribute cost can have levels of R5, R10 and R15). The power of the technique is that respondents are not asked to rate the importance of individual attributes within contrived situations. Instead, they are assigned a more realistic task – that of choosing or rating various products or services.

(Anderson *et al,* 1994) defined three distinct areas where conjoint analysis differs from other multivariate techniques

3.1.1 Conjoint analysis is a decompositional technique

With conjoint analysis, the researcher can create hypothetical products or services by combining various levels of attributes and then ask the respondent for the overall preference. Conjoint analysis then *decomposes* the preference to determine the contribution of each attribute.

This feature can be contrasted to compositional techniques such as regression analysis that “compose” overall preferences from the respondents’ evaluations of each attribute.

3.1.2 Estimates can be made at the individual level

Most other multivariate techniques make a single observation for each respondent and then analyse the data using all observations simultaneously. Estimates are then made for the population as a whole. This means that only a single measure of preference for each attribute is made, usually in isolation form the other attributes. With conjoint analysis, estimates can be made for the individual or a group of individuals since attribute levels are measured in conjunction with other attributes.

3.1.3 There are no restrictions in terms of the relationship between dependent and independent variables.

Most multivariate techniques require that a linear relationship exists between the dependent and independent variables (Marchal *et al,* 2000, Anderson *et al,* 1994), in other words that the dependent variable increases or decreases in equal amounts for each unit of change in the independent variable.

Multivariate techniques such as regression analysis also assume that the variables are at least interval scale (Marchal, *et al*, 2000). data gathered with Likert scales are ordinal in nature and any regression analysis done with this data needs to be treated with caution. Conjoint analysis only requires ordinal data and is capable of yielding interval scale results (Green and Rao, 1971).

3.2 Reasons for choosing conjoint analysis

The following is a list of reasons that justify the choice of conjoint analysis as a method for testing the propositions defined in section 2.7.

3.2.1 Conjoint analysis is able to supply the relative utility or part-worth of each attribute. This was required to verify proposition 1.

3.2.2 Once the relative utilities of each attribute have been calculated, the potential market share of various hypothetical or real products or

services can be calculated by simulating the choices of all respondents for each product. This was required to verify propositions 2 and 3.

3.3 Type of conjoint analysis

There are two issues relating to data collection that needed to be considered. The first was the presentation method. There are five major types of presentation methods (Green and Krieger, 1997; Anderson *et al,* 1994). These consist of

3.3.1. Trade-off tables. This method compares attributes two at a time by ranking all combinations of levels. There are many limitations to this method (Anderson *et al,* 1994) including a lack of realism by only comparing two attributes at a time and the large number of judgements required for even a small number of attributes. Use of this method has decreased significantly in recent years.

3.3.2. The Full Profile Technique. This method creates a hypothetical product or 'stimulus' by presenting combinations of all the attributes levels at once to a respondent. Usually the attributes are presented on a profile card and the respondent either ranks the cards or rates each one. The advantage of this method is that it can use fractional factorial designs to reduce the number of comparisons required. (Anderson *et al,* 1994). It also presents a more realistic description of the stimulus. Unfortunately, as the number of attributes increases,

so does the complexity of the stimulus. Respondents may be tempted to simplify their task by only focusing on a few attributes and ignoring the rest.

3.3.3. The Pairwise Comparison Method. This is a combination of the trade-off and full-profile method. Instead of presenting a full-profile to a respondent, a partial profile is presented consisting of a reduced number of attributes. It reduces the information overload caused by too many attributes in the full-profile method and improves on the problems of realism mentioned in the trade-off method.

3.3.4. The Compositional Technique. This method requires consumers to rank attribute levels individually and then to rank the relative perceived importance of the attributes themselves. Technically speaking, this method is not a conjoint analysis because respondents are required to rank the importance of attributes rather than choose between attributes (Green and Krieger, 1997; Anderson *et al,* 1994).

3.3.5. Hybrid Techniques. These techniques make use of a combination of the compositional technique and part-worth conjoint models. An example is adaptive conjoint analysis (ACA). This is a particularly useful technique for handling a large number of attributes. ACA is software driven and uses a compositional technique to obtain preliminary preferences for a respondent. With this information, the software can eliminate certain attributes that are unlikely to have high utilities thereby reducing the complexity of the experiment.

A second issue that needed to be considered was the measuring technique. Rank ordering requires a respondent to rank stimuli from most to least preferred. This task can be simplified with the pair-wise comparison method by asking respondents to chose between two stimuli. Ranking is likely to be more reliable and provides greater flexibility for estimating different types of composition rules (Anderson *et al,* 1994). The biggest drawback of ranking is that it is difficult to administer and usually requires a personal interview setting.

Rating requires respondents to rate a stimulus on a scale (usually a 10 point scale). This method offers the researcher the ability to perform a conjoint study via unsupervised questionnaires. Unfortunately, respondents tend to be less discriminating than when using rank ordering and this could result in a loss of variance (Anderson *et al,* 1994).

3.4 Limitations of conjoint analysis affecting the research

3.4.1 Logistical constraints

Due to a lack of available hybrid conjoint analysis software packages and the budgetary constraints of the research, the research was restricted to the use of a full-profile technique.

Logistical constraints also restricted the use of rank ordering techniques. Questionnaires were distributed via e-mail to potential respondents and

both Aaker & Day (1990) and (Anderson *et al,* 1994) pointed out that rank ordering techniques were not suited for this type of data gathering. However, by restricting the questionnaire to 9 cards that needed to be ranked, the author and supervisors were of the opinion that this task would be manageable for respondents.

3.4.2 Number of attributes

Section 2.3 of the literature review revealed 13 attributes that were relevant to consumer perceptions of payment methods. The full-profile technique is limited in the number of attributes that can be considered. This is because the complexity and the number of the profiles that has to be considered by respondents increase dramatically as the number of attributes increases, resulting in a tedious process of sorting or rating.

The limitation was overcome in three ways

1) The scope of the research eliminated some of the attributes
2) An analysis of the attributes revealed that inter-attribute correlation existed. This required certain attributes to be left out of the conjoint study and placed in a supplementary data section.
3) Attributes that were regarded as less important were removed from the conjoint analysis section and were studied in the supplementary data section.

3.4.3 Unfamiliar concepts

A final limitation of conjoint analysis is that the study becomes more complicated when conducting product concept tests with concepts that are unfamiliar to the respondent (Green and Krieger, 1997). This was particularly relevant to the research since it was highly unlikely that any of the respondents had experience in using e-purses. The questionnaire supplied a detailed explanation of the scenarios and the various stimuli in order to help the respondent conceive the new product offering.

3.5 Attributes that could be removed from the study

Although the following attributes were relevant to consumer perceptions of payment methods, they fell outside of the scope of the research.

3.5.1 Transaction receipts

This attribute was left out because it was assumed that all the payment methods could offer receipts if required.

3.5.2 Acceptability

Acceptability is arguably one of the most important features influencing cash use. Only retail environments where all payment methods were accepted were considered in the research. The focus was on what

motivated a consumer to use one payment method over another when he or she had the opportunity to choose between various methods.

3.5.3 Transfer time

Transfer time has been significantly reduced by the introduction of electronic payment methods (Greenspan, 1996). However, the need for transfer time is still prominent in cheque payments.

One of the primary advantages of delayed transfer times is that payments can be made before the required funds are deposited into the consumer's account (Foxall and Szmigin, 1999). However, since the research scope was limited to 'normal' or 'middle of the month' payment situations, the need for this type of functionality fell outside the scope of this research.

3.6 Inter-attribute correlation

3.6.1 Unbelievable stimuli

A pilot conjoint study conducted on six respondents revealed that certain attributes uniquely associated with cash resulted in the creation of unrealistic profiles.

For example, an advantage of cash is that it is tangible and consumers can always determine how much they have (refer to section 2.3.1). When this

budget ability attribute level was placed in a profile along with a security level which described a product as ‘PIN protected’, the respondents complained that such profiles were unrealistic and confusing.

This problem was overcome by using conjoint analysis ***only*** to analyse attributes and levels that could be associated with electronic payment methods. In other words, the attribute levels uniquely associated with cash were left out of the conjoint analysis. Cash was analysed in the supplementary data section.

The research was therefore constructed to present respondents with a list of electronic payment methods (the conjoint analysis ‘stimuli’) and asked two types of questions

1) *If you had to use an electronic payment method for low value purposes, which ones in the list would you use?*

This question was handled by the conjoint analysis section.

2) *Which payment methods in the list would you prefer to use instead of cash.*

This question was handled by the supplementary data section.

Although leverage was not tested in the pilot study, it was assumed that the inclusion of this attribute in the conjoint study would create confusing profiles, especially if the profiles strongly resembled debit cards or cheques. Leverage was also tested in the supplementary section.

3.6.2 Super-attributes

Due to the logistical constraints of the conjoint analysis questionnaire (see section 3.4.1) budgeting ability, performance and transaction delays could not be included as separate attributes. These attributes were combined to create a super-attribute (Anderson *et al, 1994)* called 'Convenience'. Transaction delays were implied by describing a payment method as 'having to go 'on-line'. Since performance problems can invariably be associated with on-line communication problems, performance issues were not measured individually but were implied in the on-line references. If respondents regarded performance as important, it was assumed that they would favour payment methods that do not need to go on-line.

3.7 Attributes with low levels of importance

The pilot conjoint study also revealed that reversibility and the availability of transaction records were noticeably less important than attributes such as security and cost. These findings were by no means conclusive, but they did correlate with the relative size of the regression coefficients calculated for the attributes in Hirschman's (1982) study. These attributes were

assumed to be relatively unimportant and could therefore be left out of the conjoint study. Perceptions towards these attributes were tested in the supplementary data section.

3.8 Questionnaire structure

The questionnaire was composed of three sections.

3.8.1 Demographic section

Questions 1 and 2 determined the respondent's age and gender.

Question 3 related to a respondent's employment status. Many of the respondents were post-graduate students who had prior exposure to the various payment methods. Their experiences relating to payment methods in the past were still of value to this research. Under-graduate students were not considered for this research.

Question 4 related to a respondent's income.

3.8.2 The conjoint analysis section

Question 5 measured the attributes in question via the full-profile presentation method. Respondents were asked to rank each profile from least preferred to most preferred.

Conjoint analysis revealed the relative utility of each attribute. This was analysed using matched pair t-tests to determine if there was a difference in the relative utilities. This was needed for testing proposition 1.

The potential market share of all the payment methods could then be calculated by simulating the choices of all respondents for each product. This was required to verify or reject propositions 2 and 3.

3.8.3 Supplementary data section

The primary purpose of this section was to test the various assumptions that were made about the relative importance of certain attributes. Leverage, reversibility and transaction records were assumed to be of low importance to a respondent's perception of payment methods and were left out of the conjoint study. The bases for these assumptions were supplied by the literature review and the results of a pilot study. The author intended to use these results as an indication of areas that needed further research.

Question 6 and 7 were designed to help confirm or deny any deductions made from the results of the conjoint analysis about cash. Question 6 asked respondents to rate which of the 9 cards they would definitely use instead of cash and question 7 asked which of the 9 cards they definitely wouldn't use instead of cash. The potential market share of cash in relation to each of the nine cards was calculated and compared to the responses in an attempt to determine how accurate the conjoint analysis prediction regarding cash was.

The results generated for questions 8-15 supplied ordinal data that was used in a nonparametric matched pair t-test (Friedman test) in SPSS to test proposition 1.

Nonparametric matched pair t-tests were used to determine whether any of the attributes measured in questions 8-15 were significantly more important than others.

- Question 8 related to transaction cost
- Question 9 related to the level of security offered by the payment method. The context in which security was referred to in this question was different to the context used in the conjoint analysis. In the conjoint analysis, respondents were reminded that security related to all their funds in their account. Carrying smaller amounts of cash could reduce a respondent's exposure. Some discrepancy between the results supplied by this question and those supplied by the conjoint analysis were anticipated.
- Question 10 was designed to test the impact of the complexity of a payment method.
- Question 11 tested the importance of budget ability.
- Question 12 was designed to test the impact of transaction time. In this context transaction time was regarded as synonymous with the inconvenience associated with various payment methods such as PIN presentation or having to sign a slip.

- Question 13 was designed to test if leverage potential was relevant for small value transactions. The question had to make respondents aware of the difference between leverage potential and the interest free period offered on most bank credit cards.
- Question 14 tested the impact of reversibility
- Question 15 tested the impact of transaction records
- Question 16 was designed to test the level of security exposure respondents were prepared to subject themselves to.
- Question 17 was needed to help determine actual usage patterns. This information was required to measure the correlation between preference for attributes and actual usage.

3.9 Conjoint analysis attributes and levels

Each attribute had 3 levels associated with it. The following is a description of each attribute and its 3 levels.

3.9.1 Transaction costs

- Free. Credit card transactions are free if the interest free period of between 45 and 55 days is considered (Moneymax website, 2002). The monthly or yearly fees charged by many institutions are paid regardless of whether the card is used for low value transactions or not.
- 2%. Cash withdrawal fees range from between R0, 85 to R2, 28 for the first R100 withdrawn. (Moneymax website, 2002). Since consumers

have the option of withdrawing more cash than required for the transaction, this fee would not fully impact a R20 purchase.

- 4%. ABSA charges R1.70 per debit card transaction. For a purchase of R20, this would amount to 3.4%.

3.9.2 Security

- If funds were stolen, they could not be replaced. This was relevant to cash and non-PIN protected e-purses.
- Funds were PIN protected and could not be stolen. This was relevant to e-purses with PIN protection and debit cards. Technically speaking, funds on PIN protected e-purses can be stolen but e-purse schemes usually offer to refund the outstanding balance on the card in these circumstances.
- Funds could only be stolen if a signature was copied and the theft or loss was not reported.

3.9.3 Complexity

- The payment method was linked to an existing savings or cheque account. This resembled debit card, cash and cheque payment methods.
- The payment method required a separate savings account that could only be used for payments at retailers who accepted electronic payments. This was designed to resemble e-purses. The scenario was

not entirely accurate since funds will actually be loaded onto the card. However, since consumers were likely to be more familiar with the separate account concept, this concept description was chosen to help reduce confusion.

- The payment method treated all payments as debts that had to be settled within 30 days to prevent interest charges.

3.9.4 Convenience

Convenience in the context of this research was a combination of transaction delays and budget ability.

- All transactions were quick and easy. No online communications were required to perform the sale or to determine the available balance in an account or on the card. This level was designed to try and emulate the tangible nature of cash as closely as possible.
- All transactions were performed off-line except sales when a certain balance was exceeded. Thereafter, an online transaction was required. This attribute was designed to emulate e-purse schemes that would require an on-line connection to reload a card if the funds on the card were depleted.
- All transactions were performed on-line.

3.10 Sampling technique

A ‘snowballing’ technique was used to obtain a suitable number of responses. A convenience sample of MBA students, selected parents of pupils at St Stithians College and selected acquaintances of the author were chosen. The sample was then asked to distribute the questionnaire to as many of their work colleagues and other acquaintances as possible.

The following observations of the chosen convenience sample were used to justify the choice

1) All respondents had work experience. This was essential to the research since they would be referring to their own sources of income and not to allowances, scholarships or parental loans.
2) All respondents were likely to have experience in using credit cards, debit cards, cheques and cash.
3) All respondents had a sufficient level of education to ensure that the full profile ranking technique could be used in an unattended fashion.
4) A sufficient level of demographic diversity could be obtained through the convenience sample and through the respondents’ lists of acquaintances.

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4 RESULTS

Of the 163 completed questionnaires collected, 15 were incomplete and a further 23 were incorrectly answered. These questionnaires were discarded. 125 questionnaires were processed.

Part-worth estimates for each attribute level individual were calculated as well as the relative importance for each attribute at the individual level in accordance with the methodology suggested by Anderson *et al* (1994). The results have been included in table C1 in appendix C.

4.1 Proposition 1

Within low-value payment situations, there exists a hierarchy of preference by consumers for payment method attributes.

Two separate tests were run to help prove this proposition. These were the conjoint analysis and the paired sample t-tests that were run on the information supplied by the supplementary section.

4.1.1 Conjoint analysis results

Paired samples t-tests were performed on the calculated relative importance of each attribute at the individual level using SPSS. The intention was to determine if there was a significant difference in the relative importance assigned by each individual to each attribute.

Proposition 1 could be rewritten as the alternate hypothesis H(a): At least one attribute had a mean relative importance percentage that significantly differed from the mean relative importance percentage of the other attributes.

Step 1: Hypotheses

H(0) : μ(cost) = μ(security) = μ(complexity) = μ(convenience)

H(a) : at least one mean $\neq$

Step 2: Significance levels

A significance level α of 0.05 was chosen.

Step 3: Critical value

Reject the null hypothesis if at least one ρ-value (significance value) was less than 0.05. The critical value for t with 124 degrees of freedom was calculated using Excel as being 1,979.

Step 4: Analysis of results

Table 2 shows the results generated by SPSS. The results showed that the null hypotheses for the pairs COSTS-COMPL, COSTS-CONV, SECURITY-COMPL and SECURITY-CONV could be rejected since their ρ-values (found in the right-most column denoted sig.) were less than 0.05. Furthermore, the upper and lower confidence intervals of the difference in each case did not include 0 and their t-values were greater than the critical value of 1,979.

Table 2. Matched pair t-test results of the group relative utility of each attribute

	Paired Differences					t	df	Sig. (2-tailed)
				95% Confidence Interval of the Difference				
Pairs	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
COSTS - SECURITY	-3,6749E-02	,3098	2,771E-02	-9,1586E-02	1,809E-02	-1,326	124	,187
COSTS - COMPL	9,319E-02	,2733	2,444E-02	4,481E-02	,1416	3,813	124	,000
COSTS - CONV	,1194	,2685	2,401E-02	7,190E-02	,1670	4,974	124	,000
SECURITY - COMPL	,13	,25	2,22E-02	8,60E-02	,17	5,848	124	,000
SECURITY - CONV	,1562	,2502	2,238E-02	,1119	,2005	6,979	124	,000
COMPL - CONV	2,624E-02	,2092	1,871E-02	-1,0796E-02	6,328E-02	1,402	124	,163

This meant that the alternate hypothesis could be accepted and that proposition 1 could be accepted.

4.1.2 Supplementary data results

If proposition 1 was false, then the responses to questions 8 through to 15 would have the same means. Proposition 1 could therefore be restated as the alternate hypothesis H(a): At least one question has a mean response significantly different enough from the other questions to conclude that it has a different population mean.

The procedure used in the conjoint analysis section could not be used here because of the ordinal nature of the data. A nonparametric test was required. The data was treated as paired data and a Friedman test was run in SPSS.

Step 1: Hypotheses

H(0) : $\mu(q8) = \mu(q9) = \mu(q10) = \mu(q11) = \mu(q12) = \mu(q13) = \mu(q14) = \mu(q15)$

H(a) : at least one mean $\neq$

Step 2: Significance levels

A significance level α of 0.05 was chosen.

Step 3: Critical value

Reject the null hypothesis if the significance value was less than 0.05.

Step 4: Analysis of results

Table 3 contains the results of the Friedman test generated in SPSS on the responses to questions 8 through to 15. The significance value of 0 was less than α of 0.05 indicated that at least one sample had a mean rank different to the others. The null hypothesis could be rejected in favour of the alternate hypothesis. Proposition 1 was accepted.

Table 3. Results of Friedman test on supplementary data

Ranks

	Mean Rank
Q8	5,61
Q9	5,18
Q10	4,35
Q11	4,03
Q12	4,91
Q13	3,23
Q14	4,02
Q15	4,67

Test Statistics

N	121
Kendall's W[a]	,107
Chi-Square	90,483
df	7
Asymp. Sig.	,000

a. Kendall's Coefficient of Concordance

4.2 Proposition 2

Within the specific retail situations defined in the scope of this research, the relative advantage offered by non-PIN protected electronic payment methods over existing payment methods could help them obtain the majority share of the market for low value transactions.

The relative importance of each attribute was calculated using conjoint analysis and is shown in table 4. They demonstrated that security and cost

were significantly more important to consumers than complexity and convenience. The group relative utility for non-PIN protection was –1,269, which demonstrated that consumers reacted very negatively towards products with no PIN protection. The offline functionality offered by e-purses also had a small negative group relative utility of –0,053, which implied that the biggest selling point of non-pin protected e-purses, the convenience they offer, was not perceived to be that significant. The increased complexity of e-purses was also perceived to be insignificant.

Table 4. Summarised results of conjoint analysis

	Cost			**Security**		
	Free	**2%**	**4%**	**No Sec**	**Sign.**	**PIN**
Group Utility	1,240	0,029	-1,269	-1,579	0,435	1,144
Rel Importance		43,59%			47,29%	
	Complexity			**Convenience**		
	Credit	**Debit**	**E-purse**	**Online**	**Semi**	**Offline**
Group Utility	-0,213	-0,005	0,219	0,013	0,040	-0,053
Rel Importance		7,50%			1,62%	

The only remaining method for non-PIN protected e-purses to obtain majority market share, was to offer low cost transactions. The predicted market share for cash, credit cards, debit cards, cheques and non-PIN protected e-purses offering free transactions was calculated by calculating part-worth totals for each payment method for each individual (in accordance with the methodology suggested by Anderson *et al* (1994)).

The payment methods were then ranked from highest to lowest and the results of all the highest ranked choices were plotted in figure 5.

Figure 5. Non-PIN protected e-purse market share

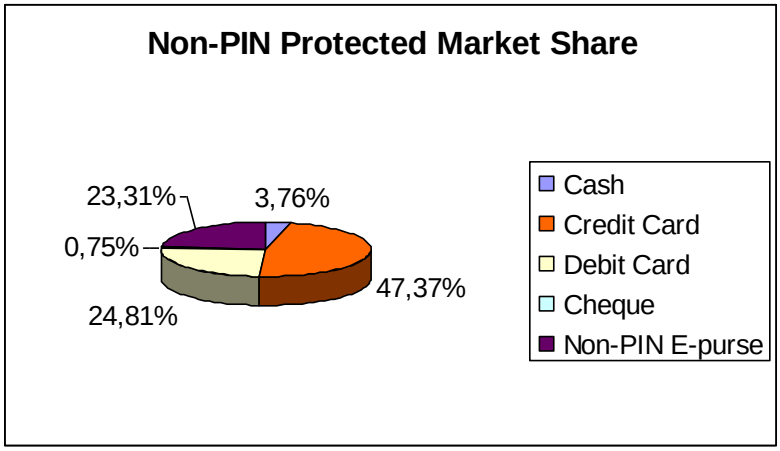


Table 5 contains the levels that were used for each payment method. The 2% charge for cash was estimated by applying withdrawal fees to a R100 withdrawal. Credit cards are free if the balance is paid within 55 days. Debit cards and cheques cost considerably more than 4% for a R20 transaction but this was the limit imposed by the analysis.

Table 5. Attribute levels used for each payment method

Method	**Cost**	**Security**	**Complexity**	**Convenience**
Cash	2%	No	Debit Cards	Off line
Credit Cards	0%	Signature	Credit Cards	On line
Debit Cards	4%	PIN	Debit Cards	On line
Cheques	4%	Signature	Debit Cards	Off line
PIN E-purse	0%	PIN	E-purse	Off line
NON-PIN E-purse	0%	No	E-purse	Off line

Figure 5 shows that a non-PIN protected e-purse scheme that charges no fees to the client has a predicted market share of 23.31% with credit cards and debit cards attracting larger market shares.

Since non-PIN protected e-purses were not predicted to obtain majority market share, proposition 2 was rejected.

4.3 Proposition 3

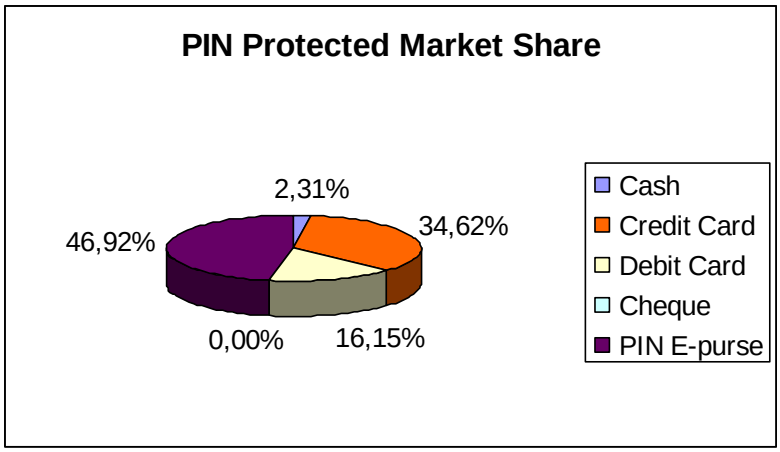
Within the specific retail situations defined in the scope of this research, the relative advantage offered by PIN protected electronic payment methods over existing payment methods could help them obtain the majority share of the market for low value transactions.

The information shown in Table 4 was also pertinent to this proposition. The group relative utility for PIN protection was 1,144, which showed that consumers were likely to react favourably to products with PIN protection. As with non-PIN protected e-purses, the increased complexity created by e-purses actually had a positive group relative utility of 0,219 but since the overall importance of the attribute was only 7,01%, this characteristic had no real significance. The increased convenience e-purses offered was also perceived to be insignificant.

The predicted market share for cash, credit cards, debit cards, cheques and non-PIN protected e-purses offering free transactions was calculated

by calculating part-worth totals for each payment method for each individual (Anderson *et al* (1994)). The payment methods were then ranked from highest to lowest and the results of all the highest ranked choices have been plotted in figure 6.

Figure 6. PIN protected e-purse market share



The 46.92% market share that was calculated for PIN protected E-purses led to the acceptance of proposition 3. This needed to be treated with caution though. Table 6 highlights the impact that transaction cost made on the predicted market share. The market share was severely impacted by an increase in fees to the point where the proposition could no longer be accepted.

Table 6. Impact of fees on market share

	Market share		
Fee	**0%**	**2%**	**4%**
PIN Prot	46,92%	34,38%	24,03%
Credit card	34,62%	40,63%	46,51%

4.4 Additional information

4.4.1 Accuracy of predictions regarding cash

Questions 6 and 7 were used to test the conjoint analysis questionnaire's accuracy in predicting the market share of cash. The part-worth total of cash was calculated for each individual and then ranked against the nine cards. This was then compared to the results obtained in question 6 and 7. A respondent who indicated that he or she would rather use a card instead of cash, should also have a higher rank for that card rather than cash. Similarly, a respondent who indicated that he or she would definitely not use a card instead of cash should have a lower rank for that card than for cash.

Table 7 contains the number of correct and incorrect predictions. A correct prediction is one where the calculated rank for cash was lower than the ranks of the chosen cards in question 6 and higher than the ranks of the chosen card in question 7.

Table 7. Results of questions 6 and 7

	Q6	**Q7**
Correct	444	208
Incorrect	220	480
Totals	664	688
% Correct	66,87%	30,23%

The conjoint analysis predicted rank for cash was fairly accurate (66,87%) when compared to the cards that consumers indicated they would want to use instead of cash. This suggested that the conjoint analysis was fairly accurate in predicting which products could be positioned as replacements for cash.

The conjoint analysis predicted rank for cash was fairly inaccurate (30,23%) when compared to the cards that consumers indicated they would definitely not want to use instead of cash. This suggested that, even if there was a desire for a product that could offer relative advantage over cash, there was a strong tolerance for the perceived disadvantages of cash. It was also likely that there were attributes associated with cash that had not been identified in the research.

4.4.2 Test of assumptions

Although table 2 in section 4.1.2 does indicate that the respondents' perceptions of at least two attributes were significantly different, it does not state exactly which two. It was assumed that leverage, the ability to reverse transactions and transaction records would not significantly affect a respondent's perception of a payment method. These assumptions were tested by questions 13, 14 and 15 respectively. Since the data was ordinal in nature, a nonparametric matched pair sample test was required. Wilcoxon signed rank tests were used with an α of 0,05 in each case.

4.4.2.1 Question 13 - Leverage

The results of question 13 (which tested the need for leverage) were compared to the results of questions 8 to 12 using Wilcoxon signed rank tests and the results have been included in table C1 in appendix C. In all cases, comparisons had significance values less than α which proved that the distribution of ranks in question 13 was different to the distribution of ranks of each of questions 8 to 12. Table C1 shows that the number of individual responses where the rank in question 13 was less than the rank in each of questions 8 to 12 significantly outnumbered the number of responses were the opposite applied.

The supplementary section confirmed the assumption that leverage had less of an impact on consumer perceptions of payment methods than cost, security, complexity, budget keeping ability and ease of use.

4.4.2.2 Question 14 – Transaction reversals

The results of question 14 (which tested the need for transaction reversals) were compared to the results of questions 8 to 12 using Wilcoxon signed rank tests and the results have been included in table C2 in appendix C.

It was proved in the supplementary section that distributions of ranks in question 14 was different to the distribution of ranks of each of questions 8,

9 and 12 since each comparison had significance values less than α. No discernable difference between the distributions of ranks for question 14 and each of questions 10 and 11 could be found (significance values were greater than α).

Table C2 shows that the number of individual responses where the rank in question 14 was less than the rank in each of questions 8,9 and 12 significantly outnumbered the number of responses were the opposite applied.

The supplementary section confirmed the assumption that the need for transaction reversals had less of an impact on consumer perceptions of payment methods than cost, security and ease of use but failed to show that it was less important than complexity and budget-keeping ability.

4.4.2.3 Question 15 – Transaction records

The results of question 15 (which tested the need for transaction records) were compared to the results of questions 8 to 12 using Wilcoxon signed rank tests and the results have been included in table C3 in appendix C.

It was proved in the supplementary section that distributions of ranks in question 15 was different to the distribution of ranks of each of questions 8, 9 and 11 since each comparison had significance values less than α. No

discernable difference between the distributions of ranks for question 15 and each of questions 10 and 12 could be found (significance values were greater than α).

Table C3 shows that the number of individual responses where the rank in question 15 was less than the rank in each of questions 8 and 9 significantly outnumbered the number of responses were the opposite applied. However, the number of individual responses for where the rank in question 15 was greater than the rank in question 11 significantly outnumbered the number of responses were the opposite applied.

The supplementary section confirmed the assumption that the need for transaction records had less of an impact on consumer perceptions of payment methods than cost and security but failed to show that it was less important than complexity and ease of use. The supplementary section also demonstrated that the assumption that transaction records were less important than budget-keeping ability was wrong.

5 INTERPRETATION OF RESULTS

The purpose of this research was to determine whether e-purse schemes could be positioned as an alternative to existing payment methods for low value transactions. For this purpose, 3 propositions were stated and were tested in using conjoint analysis. This section analyses the relevance of the findings detailed in section 4 in terms of the overall objectives of the research.

5.1 Proposition 1

It was demonstrated in section 4 that there was a hierarchy of preference for payment method attributes. This supported the findings of Hirschman (1982) and Ho and Ng (1994).

Cost and Security were perceived to be significantly more important than the benefits offered by a payment method that offered the increased convenience of quick offline transactions. They also significantly outweighed the detrimental effects of the increased complexity of e-purse systems which Rogers (1962) and Bourne and Szmigin (1999) described as being significant in the adoption of e-purse schemes. The findings relating to security were supported by Hirschman (1982), Ho and Ng (1994) and Kara *et al* (1994).

E-purses have the ability to capitalize on the significant importance attached to cost. The benefit gained by institutions from the reduced infrastructure and communications costs created by e-purse schemes can be passed on the consumer in the form of reduced transaction fees.

PIN protected e-purse schemes also have the ability to capitalise on the significant importance attached to security, especially since the group relative utility of PIN protection (1,144) was the highest of all the relative scores for security attribute levels (table 4).

The relative importance of complexity and convenience are noticeably less than those of security and cost. Credit cards can be viewed as a cost free alternative for low value transactions if the outstanding balance is paid within 55 days (Moneymax website, 2002). They could therefore be positioned as competitors to e-purses for low value transactions, especially non-PIN protected e-purses since they offer greater security.

E-purse complexity actually experienced a positive group utility of 0,219, despite fears that it would actually negatively affect perceptions about e-purses. This implied that the additional complexity offered by e-purses was actually regarded as an advantage. A possible explanation for this can be obtained from Hirschman's (1982) research. Respondents could possibly have identified an additional advantage of being able to control spending since they could control how much was preloaded onto the card. This aspect needs to be researched further.

There was little evidence to suggest that the online or offline functionality will have any affect on a consumer's perception of payment systems.

5.2 Proposition 2

Although proposition 2 was rejected, the 23,31% market share that was calculated might still be sufficient for an institution to continue with a non-PIN protected e-purse scheme. An important point though is that the success of this scheme would be riding entirely on the cost benefit perceived by the consumer. If the scheme does not offer such a benefit, it is unlikely that it would succeed since the increased benefit of convenience and speed offered was perceived as being insignificant.

Despite being a more expensive option, debit cards were also predicted to obtain a higher market share than non-PIN protected e-purses. This would suggest that a significant market segment exists that would be prepared to pay a premium for the increased security that they offer.

An interesting observation from the results of figure 5 in section 4, is that credit cards are predicted to enjoy a 47,37% market share. Yet, when questioned what payment methods they normally used for low-value transactions, only 5 of the 125 respondents said they normally used credit cards compared to the 119 who said they normally used cash. This implied that consumers did not perceive the benefits offered by credit cards in terms of cost (a fact that was observed by Durkin (2000)) or security.

It is therefore still possible to market a non-PIN protected e-purse as an alternative to existing payment methods for low-value transactions since the indications are that its primary competitor, credit cards, are not perceived as offering any real benefits over cash. This still means, however, that the non-PIN protected e-purse would have to be perceived as offering greater benefits than cash- a task described by Bourne and Szmigin (1999) as unlikely.

Another possible explanation for the low use of credit cards for low value transactions among the respondents is Hirschman's (1982) observations concerning the importance of acceptability. A non-PIN protected e-purse might be able to offer relative advantage in terms of cost but it still has to offer relative advantage in terms of where the card can be accepted. Lefebvre (1999) observed that prepaid vending machines (such as payphones, parking meters, etc) offer a way to successfully promote e-purse schemes without the need for wide-scale acceptance.

The results of proposition 2 suggest that in this case, it is possible to extend the use of the smart cards into retail environments. Unfortunately, this is unlikely to occur on a large scale. Security still remains an issue.

5.3 Proposition 3

PIN protected e-purses can capitalise on the importance of security and cost and were predicted as being able to capture a 24,06% higher market share than their closest competitor, credit cards, on the basis that PIN protection (with a group utility of 1,144) was perceived as offering greater security than signature protection (group utility of 0,435).

The literature review identified a concern that that the increased complexity created by e-purses when consumers have to pre-load funds onto their cards would negatively affect the rate of adoption of the e-purse scheme. Although the rate of adoption might still be affected, the relatively low importance placed on complexity suggested that the benefits offered by the increased security and reduced costs offered by PIN protected e-purses would be sufficient to ensure that they would be perceived as offering greater advantage than existing payment methods. In any case, respondents viewed the complexity created by e-purses as a positive factor since it had a group relative utility of 0,219.

The relatively low importance assigned to convenience (which was designed to include budget-keeping ability) does to some extent concur with Hirschman's (1982) findings that the budget keeping ability offered by cash does not have a large influence over the actual use of cash. Bourne and Szmigin's (1999) observation, however, suggested that the budget-keeping ability of cash would play a large role in preventing the adoption of

an e-purse scheme. The findings in section 4.3 however, suggested that a PIN protected e-purse scheme's ability to capitalise on the importance of security and cost would be sufficient to overcome this problem.

5.4 Implications of the findings

The research findings strongly suggested that any payment method that offered consumers low transaction costs and increased security relative to existing payment methods could be positioned to gain a significant share of the low value transaction market.

This did not imply that consumers would automatically perceive these advantages. As Rogers (1962) noted, it is not the actual advantage that matters, it is what the perceived advantage is that really affects a consumer's rate of adoption. The findings suggested that of the existing payment methods, credit cards were the most likely to be used for low value transactions.

The fact that only 5 of the 125 respondents indicated that they normally used credit cards for low value transactions indicated that the cost and security advantages offered by credit cards over cash were not perceived by consumers. It is possible that consumers are not aware of the costs involved in paying with cash.

Table 8 also indicates that only 3,2% of respondents indicated that they regarded more than R20 as being unsafe to carry. This implied that, although there appears to be a strong need for security in payment methods, cash is not currently perceived as containing a security risk for transactions less than R20 in value. Any effort made to market PIN protected e-purses would have to attempt to alter this perception.

Table 8. Frequency distributions for question 16

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-R20	4	3,2	3,2	3,2
	R20-R50	9	7,1	7,2	10,4
	R50-R100	24	19,0	19,2	29,6
	R100-R200	47	37,3	37,6	67,2
	R200-R400	25	19,8	20,0	87,2
	> R400	16	12,7	12,8	100,0
	Total	125	99,2	100,0	
Missing	System	1	,8		
Total		126	100,0		

Finally, section 4.4 found evidence suggesting that the assumption that the need for transaction reversals and transaction records were relatively unimportant was wrong. This does not alter the findings of the research since e-purses are capable of offering transaction reversals as well as a transaction history.

6 CONCLUSION

6.1 Summary

The purpose of this research was to determine whether electronic purse (e-purse) schemes could be positioned as alternatives to existing payment methods for low value transactions. The focus was on low value transactions since it was widely believed that this was the area that e-purse schemes were best suited for. Credit cards, Debit cards, cheques, cash, PIN protected e-purse schemes and non-PIN protected e-purse schemes were considered in the research.

An e-purse scheme can briefly be described as a scheme whereby the consumer is issued a smart card on which he can preload funds. A smart card is a plastic card the size of a credit card with a microprocessor chip embedded in it. The chip is extremely secure and is capable of performing cryptographic and arithmetic functions.

Once funds are loaded onto the smart card, they can be spent at any merchant that has been equipped with a point-of-sale (POS) device capable of accepting e-purse transactions. Since the smart card is capable of performing arithmetic functions, the sale does not require a modem connection to the bank's mainframe computers to authorise the transaction. The need for expensive infrastructure is also not required which means that e-purse schemes are well suited for rural areas where

communications infrastructure is poor or for use in devices where modem connections are impractical such as public transport, vending machines, etc. These are cost-saving features that could be passed onto the consumer in the form of cheaper transaction fees.

A distinction had to be made between PIN protected e-purse schemes and non-PIN protected schemes. PIN protected e-purse schemes were capable of refunding the funds loaded on the smart card in the event of the card being lost or stolen. Non-PIN protected e-purse schemes were capable of being used in environments where PIN protection was impossible or impractical such as public transport.

The failure of many e-purse schemes around the world had been blamed on many factors including the fact that consumers have simply not adopted the concept. The research analysed this failure of adoption within the diffusion of innovations framework first introduced by Rogers in 1962. Within this framework, the concept of 'relative advantage' was introduced.

A review of published literature revealed a viewpoint that e-purse schemes were unlikely to offer relative advantage over cash. This was based on the observation that cash was far more widely accepted by merchants than existing e-purse schemes and that cash was perceived as offering greater ability to control spending since it is tangible and consumers can always determine how much they have. Furthermore, e-purses were far more complex in the manner in which they were used than existing payment

methods. Within the diffusion of innovations framework, this was likely to impede the adoption of e-purses by consumers.

The following observations helped challenge this viewpoint

1. The literature review had revealed that security was a major factor influencing what payment method consumers preferred. PIN protected e-purse schemes were capable of offering greater security
2. E-purse schemes could offer greater transaction speed and convenience since they did not need online communications and did not require the counting of change. The literature review determined that these factors were also important to a consumer's overall perception of a payment system
3. The cost saving features of e-purse schemes could be passed on to the consumer in the form of cheaper transaction fees

Conjoint analysis was used to analyse the relative importance of cost, security, budget-keeping ability, speed, complexity and convenience. Conjoint analysis was also be used to predict the relative market share of the e-purse schemes relative to existing payment methods despite the fact that respondents were unlikely to have experience in using them.

The findings suggested that by far the most important requirements for payment methods were low transaction costs and increased security. Respondents regarded PIN protection as being superior to signature

protection. The complexity of the payment method as well as the convenience offered in terms of transaction speed and ease at which the available transaction balance could be determined were significantly less important.

The findings suggested that consumers were unlikely to perceive non-PIN protected e-purse schemes as offering any relative advantage over existing payment methods since the greatest advantage that they offer, ease of use (at the point of sale) and increased transaction speed were not important. It was noted that even though non-PIN protected e-purses were able to offer low transaction costs as well, they were in direct competition with credit cards which could technically offer free transactions if the interest free period of 55 days offered by South African retail banks was taken into account. Credit cards also offered greater security.

The findings also suggested that consumers were likely to perceive PIN protected e-purse schemes as offering a significant relative advantage to existing payment methods. This was because they are able to capitalise on the importance that consumers place on PIN protection as well as low transaction costs.

Transaction cost was found to be extremely important in determining the likely acceptance of PIN protected e-purse schemes. If the schemes are unable to offer match the fees offered by credit cards or debit cards, then

there is little to distinguish between these products and the concept of relative advantage would be lost.

6.2 Recommendations

The actual relative importance of a payment system is not the important issue. Of far greater value is the perceived importance. This is clearly evident in the observations within the research concerning credit cards. Potentially, credit cards offer free transactions if the balance is paid within 55 days and they offer greater security than cash in the form of signature protection. Yet 119 of the 125 respondents indicated that they normally use cash for low value transactions. It is clear that consumers do not perceive the cost benefits of credit cards or the increased security.

This is the opportunity that PIN protected e-purse schemes can seize. Firstly, a perception that credit cards are an expensive payment method needs to be reinforced by focusing on the dangers of not paying off outstanding balances within the interest free period. Secondly, the consumer perception that PIN protection is better than signature protection needs to be capitalised on. Thirdly, consumers need to be reminded that cash is a) not free since there are withdrawal fees that have to be considered and b) not safe since cash is easy to lose or steal.

The research findings do not imply that non-PIN protected e-purse schemes cannot succeed. The findings simply imply that non-PIN

protected e-purse schemes are unlikely to be adopted as a preferred payment choice in retail environments where consumers can chose between a variety of payment means. Non-PIN protected e-purse schemes could still obtain a small market share of these transactions if they could offer cheap or free transaction fees.

An important conclusion is that e-purse schemes are unlikely to offer any significant relative advantage over existing payment methods if they cannot present consumers with a cheaper method of payment than existing payment methods.

6.3 Suggestions for further research

1. A 23,31% market share was predicted for non-PIN protected e-purse schemes. This is not insignificant. Further research into the type of consumer who is likely to use such a product is required.
2. Market segmentation was beyond the scope of this research. Research into the structure of the low value transaction payment market would be required.
3. The actual use of cash appears to contradict research findings that credit cards offer greater relative advantage. Research into South African consumer perceptions of cash and credit cards is suggested.

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APPENDIX A CONSISTENCY MATRIX

Research Sub-problem	**Relevant Proposition**	**Relevant Questionnaire Questions**	**Method of Analysis**
What attributes need to be considered as providing major contributions towards consumer perceptions of the payment methods?			Literature Review
What are the levels of contribution made by each attribute towards the overall consumer perception of the payment methods?	*Within low-value payment situations, there exists a hierarchy of preference by consumers for payment system attributes.*	1. Question 5 2. Questions 8-15	Conjoint Analysis 2 Sample t-tests.
Is there a perceived need for non-PIN protected electronic purses?	*Within the specific retail situations defined in the scope of this research, the relative advantage offered by non-PIN protected electronic payment methods over existing*	1. Question 5 2. Question 16 and 17	Conjoint Analysis Descriptive Statistics

	payment methods could help them obtain the majority share of the market for low value transactions.		
Is there a perceived need for PIN protected electronic purses?	*Within the specific retail situations defined in the scope of this research, the relative advantage offered by PIN protected electronic payment methods over existing payment methods could help them obtain the majority share of the market for low value transactions.*	1. Question 5 2. Question 16 and 17	Conjoint Analysis Descriptive Statistics

APPENDIX B QUESTIONNAIRE

The following questionnaire is intended for use in a project report on behalf of Wits Business School. All information supplied by you in the questionnaire is entirely confidential. The results of the questionnaire will be available upon request.

Please could you edit the document using Microsoft Word and save the document under the same name (research.doc). The completed document then needs to be e-mailed to the following address.

Sybren_no_1@yahoo.com

Please could you edit the multiple-choice questions by highlighting your chosen response and then converting the text to Bold, Italics and Underlined (this can be achieved by pressing ctrl-b, ctrl-i and ctrl-u). For example, item 6 has been selected in the following table. If possible, try to change the colour of your selection.

1	**2**	**3**	**4**	**5**	***6***	**7**	**8**	**9**	**10**

Thank you for agreeing to participate in this research

Yours sincerely

Sybren van der Leij

SECTION A

1. Age _____

2.

Male	Female

3. Approximate gross monthly income in rands. (Post graduate students – please indicate your approximate monthly income before commencing studies)

Less than 5000	5000-10 000	10 000-20 000	20 000-30 000	Greater than 30 000

4. Current Employment Status

Undergraduate Student	Post-Graduate Student	Currently Employed	Currently Unemployed

SECTION B

5. In the following section, we are trying to determine what your impressions would be of a variety of banking products such as debit cards and credit cards. Included in this collection of 9 banking products are some entirely new concepts.

   NB !!!

   For each of these products, please imagine that you are purchasing goods to the value of R20 or less at a small retail store such as a fast food outlet or a 24 hour express shop at a garage. Please assume that the outlet accepts all forms of electronic payments as well as cash and cheques.

   You are required to rank each of the payment methods presented in the next section from the method that is **most preferred (1)** to the one that is **least preferred 9)**.

   Some terminology you may require:

   POS devices

   Credit card machines, such as the 'Speed-point' used by FNB, are referred to as POS (point-of-sale) devices. POS devices enable payments via credit cards and debit cards. Please assume that POS devices will accept all 9 payment methods described on the next page.

   Electronic purses

   Electronic purses function similar to phone cards where the funds are preloaded onto the card. The difference between electronic purses and phone cards is that electronic purse cards are not thrown away when the funds on them are used up. Funds can be re-loaded onto the card at ATM's and POS devices. Funds can only be spent at retailers with POS devices.

   Security

   For each of the 9 products below please assume that, in the event of a card being lost or stolen, the funds in your account or on the card **will only be protected when you report the card lost or stolen**. This also applies to electronic purses (for electronic purses, the bank will refund the outstanding amount in the event of the card being lost or stolen.)

Please study each card carefully before making a decision.

Card 1	**Card 2**	**Card 3**
2% Transaction Cost No protection offered (Please read the note on security on the previous page) Payments treated as credit that have to be settled at the end of the month before penalties are charged No online communications with your bank are necessary for sales or balance enquiries.	Transaction is free No protection offered (Please read the note on security on the previous page) Payment is immediately debited from your existing savings or cheque account No online communications with your bank are required for balance enquiries or for sales unless a daily limit is exceeded.	4% Transaction Cost No protection offered (Please read the note on security on the previous page) The card functions as an electronic purse (see previous page). All sales and balance enquiries require online communications with your bank.

Card 4	**Card 5**	**Card 6**
Transaction is free Transactions are PIN protected (Please read the note on security on the previous page) Payments treated as credit that have to be settled at the end of the month before penalties are charged All sales and balance enquiries require online communications with your bank.	2% Transaction Cost Transactions are Signature Protected (Please read the note on security on the previous page) Payment is immediately debited from your existing savings or cheque account All sales and balance enquiries require online communications with your bank.	4% Transaction Cost Transactions are PIN protected (Please read the note on security on the previous page) Payment is debited from your existing savings or cheque account No online communications with your bank are necessary for sales or balance enquiries.

Card 7	**Card 8**	**Card 9**
4% Transaction Cost Transactions are Signature Protected (Please read the note on security on the previous page) Payments treated as credit that have to be settled at the end of the month before penalties are charged No online communications with your bank are required for balance enquiries or for sales unless a daily limit is exceeded.	Transaction is free Transactions are Signature Protected (Please read the note on security on the previous page) The card functions as an electronic purse (see previous page). No online communications with your bank are necessary for sales or balance enquiries	2% Transaction Cost Transactions are PIN protected (Please read the note on security on the previous page) The card functions as an electronic purse (see previous page). No online communications with your bank are required for balance enquiries or for sales unless a daily limit is exceeded.

Please rank each card in the table below. 1 = most preferred: 9 = least preferred

EXAMPLE

If you ranked card number 5 as the most preferred payment system, your entry into the table would be as follows:

Card No	**Card 1**	**Card 2**	**Card 3**	**Card 4**	**Card 5**	**Card 6**	**Card 7**	**Card 8**	**Card 9**
Rank					1				

If you felt that Card number 7 was your next most preferred card, your entry into the table would be as follows:

Card No	**Card 1**	**Card 2**	**Card 3**	**Card 4**	**Card 5**	**Card 6**	**Card 7**	**Card 8**	**Card 9**
Rank					1		2		

If you felt that Card number 3 was your ***least preferred*** card, your entry into the table would be as follows:

Card No	**Card 1**	**Card 2**	**Card 3**	**Card 4**	**Card 5**	**Card 6**	**Card 7**	**Card 8**	**Card 9**
Rank			9		1		**2**		

Please note that no two cards can have the same rank.

PLACE YOUR ENTRIES INTO THE TABLE BELOW

Card No	**Card 1**	**Card 2**	**Card 3**	**Card 4**	**Card 5**	**Card 6**	**Card 7**	**Card 8**	**Card 9**
Rank									

SECTION C

6. Please indicate which of the 9 products (if any) presented in section B you would prefer to use as opposed to cash when purchasing goods valued at less than R20. You may cross more than one square.

1	2	3	4	5	6	7	8	9

7. Please indicate which of the 9 products (if any) presented in section B you definitely would not use instead of cash when purchasing goods valued at less than R20. You may cross more than one square

1	2	3	4	5	6	7	8	9

Please indicate on a scale of 1 to 10 with 10 being the highest, the extent to which the following attributes influence your decision as to whether you would use cash, a debit card, a credit card or a cheque for a purchase amount of less than R20.

8.

The cost of the transaction

1	2	3	4	5	6	7	8	9	10

9.

The level of protection the system offers against theft

1	2	3	4	5	6	7	8	9	10

10.

The manner in which your accounts are affected by the transaction. For instance, credit card bills have to be paid off within a certain time before interest is charged. Debit cards, on the other hand, debit the amount from your account almost immediately.

1	2	3	4	5	6	7	8	9	10

11.

The extent to which the payment method helps you to determine how much money you have or how much credit you have left.

1	2	3	4	5	6	7	8	9	10

12.

The level of convenience or ease of use offered by the payment system. In other words, if you regard one method to be less cumbersome to use over another, please indicate how much influence this has in your choice.

1	2	3	4	5	6	7	8	9	10

13.

The need to borrow money. In this context, using your credit card and paying off the debit before interest is charged is not regarded as borrowing. This question refers to the actual credit facility or a bank overdraft.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

14.

The ability to reverse a transaction at the point of sale.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

15.

The extent to which a payment method supplies accurate transaction records for each purchase.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

16. Approximately how much cash (in rands) do you regard as being safe to carry on your person at any given time?

R0-R20	R20-R50	R50-R100	R100-R200	R200 – R400	More than R400

17. Please indicate which payment method you would normally use for purchases less than R20. Please choose only one.

Cash	Cheque	Debit Card	Credit Card

APPENDIX C RESULTS

Table C1. Wilcoxon Signed Ranks Tests on Q8-12 and Q13

Ranks

		N	Mean Rank	Sum of Ranks
Q13 - Q8	Negative Ranks	89	57,99	5161,50
	Positive Ranks	21	44,93	943,50
	Ties	12		
	Total	122		
Q13 - Q9	Negative Ranks	83	59,33	4924,50
	Positive Ranks	27	43,72	1180,50
	Ties	14		
	Total	124		
Q13 - Q10	Negative Ranks	74	62,40	4617,50
	Positive Ranks	34	37,31	1268,50
	Ties	16		
	Total	124		
Q13 - Q11	Negative Ranks	66	58,03	3830,00
	Positive Ranks	37	41,24	1526,00
	Ties	21		
	Total	124		
Q13 - Q12	Negative Ranks	83	62,14	5157,50
	Positive Ranks	30	42,78	1283,50
	Ties	10		
	Total	123		

Test Statistics

	Q13 - Q8	Q13 - Q9	Q13 - Q10	Q13 - Q11	Q13 - Q12
Z	-6,303	-5,595	-5,149	-3,812	-5,561
Asymp. Sig. (2-tailed)	,000	,000	,000	,000	,000

a Based on positive ranks.
b Wilcoxon Signed Ranks Test

Table C2. Wilcoxon Signed Ranks Tests on Q8-12 and Q14

Ranks

		N	Mean Rank	Sum of Ranks
Q14 - Q8	Negative Ranks	70	53,86	3770,50
	Positive Ranks	29	40,67	1179,50
	Ties	24		
	Total	123		
Q14 - Q9	Negative Ranks	72	48,60	3499,00
	Positive Ranks	24	48,21	1157,00
	Ties	29		
	Total	125		
Q14 - Q10	Negative Ranks	59	57,98	3421,00
	Positive Ranks	48	49,10	2357,00
	Ties	18		
	Total	125		
Q14 - Q11	Negative Ranks	54	47,42	2560,50
	Positive Ranks	48	56,09	2692,50
	Ties	23		
	Total	125		
Q14 - Q12	Negative Ranks	61	58,41	3563,00
	Positive Ranks	40	39,70	1588,00
	Ties	23		
	Total	124		

Test Statistics

	Q14 - Q8	Q14 - Q9	Q14 - Q10	Q14 - Q11	Q14 - Q12
Z	-4,538	-4,298	-1,659	-,221	-3,358
Asymp. Sig. (2-tailed)	,000	,000	,097	,825	,001

a Based on positive ranks.
b Based on negative ranks.
c Wilcoxon Signed Ranks Test

Table C3. Wilcoxon Signed Ranks Tests on Q8-12 and Q15

Ranks

		N	Mean Rank	Sum of Ranks
Q15 - Q8	Negative Ranks	66	49,18	3246,00
	Positive Ranks	31	48,61	1507,00
	Ties	26		
	Total	123		
Q15 - Q9	Negative Ranks	49	42,49	2082,00
	Positive Ranks	30	35,93	1078,00
	Ties	46		
	Total	125		
Q15 - Q10	Negative Ranks	52	51,63	2684,50
	Positive Ranks	54	55,31	2986,50
	Ties	19		
	Total	125		
Q15 - Q11	Negative Ranks	36	42,40	1526,50
	Positive Ranks	56	49,13	2751,50
	Ties	33		
	Total	125		
Q15 - Q12	Negative Ranks	54	53,50	2889,00
	Positive Ranks	44	44,59	1962,00
	Ties	26		
	Total	124		

Test Statistics

	Q15 - Q8	Q15 - Q9	Q15 - Q10	Q15 - Q11	Q15 - Q12
Z	-3,140	-2,467	-,479	-2,398	-1,650
Asymp. Sig. (2-tailed)	,002	,014	,632	,017	,099

a Based on positive ranks.
b Based on negative ranks.
c Wilcoxon Signed Ranks Test