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## New Card Technologies in Retail Banking: Competition and Collaboration in the 1990s

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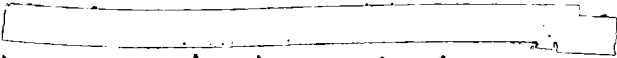
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**New Card Technologies in Retail Banking:  
Competition and Collaboration in the 1990s**

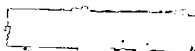
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## **Abstract**

**This thesis examines the alternative bank card technologies being considered for retail banking in the UK in the 1990s. Influential organisations suggest that this technology needs updating, and various new technologies are being developed.**

**The thesis identifies the most influential organisations within four groups considered key for retail banking technology: the technology supply industry, the adopting industry, the market and other key players. The observations and analysis in this thesis are based on information provided by each of these four key groups, through written surveys, face-to-face and telephone interviews, and from a range of written sources. A selection of past and present bank card trials are also described, with particular focus on the introduction of smart card technology.**

**Results confirm that the innovation process in the retail banking industry accords with a highly interactive model, with feedback loops throughout the innovation process. The adopting industry is seen to follow the innovation process in the opposite direction to that experienced in manufacturing industry. Thus, smaller incremental innovations eventually lead to more radical changes which effect complete systems change on a national basis - a 'reverse cycle' model of innovation.**

**The thesis analyses the evolution of competitive and cooperative strategies, particularly between banks and their collective organisations, building societies and retailers. The thesis concludes that the dominant institutions driving card technology innovation and standards globally are the international debit and credit card corporations Mastercard, VISA and Europay, operating through their organisation EMV. In the UK, the major clearing banks, and their APACS organisation, and the large retailers are also key actors. The thesis suggests that smart card is the most likely to be adopted.**

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I am also grateful for the time provided by managers from the retail banking industry for their interest in this work and for providing the data.

## **Abstract**

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## Introduction

This thesis evaluates the use of bank card technology in retail banking and considers some of the alternative technologies which may, in future, be introduced for bank cards within the United Kingdom. The bank payment clearing systems are reviewed, with particular emphasis on the different methods of payment available to the consumer at the retail point of sale. I consider the evolution of competitive and cooperative strategies within and between banks and building societies, which has brought about the national EFTPoS and ATM network, and the basic principle of product and process innovation will be introduced and considered in direct relation to the adopting industry - retail banking. Is there a greater technology push or market pull and how is the fine equilibrium balanced? Using the reverse product cycle proposed by Richard Barras as a conceptual model, I will identify the most influential organisations within four key groups, which are identified in figure 1, and discuss the interaction between each.

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**Figure 1      The four influential groups of EFTPoS in Retail Banking**

<b>Group I</b>	<b>Group II</b>	<b>Group III</b>	<b>Group IV</b>
<b>Technology Supply Industry</b>	<b>Adopting Industry</b>	<b>Market</b>	<b>Other</b>
Card Manufacturers	Banks	Consumers	Media
EFTPoS Terminal Manufacturers	Building Societies		Government
ATM Systems Manufacturers	Retailers		European Countries

**Source:      G Boxall, Open University**

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Group I, the technology supply industry consists of the technology supply industry - bank card manufacturers, EFTPoS and ATM system manufacturers and the scientists on the 'technology push' side of the innovation model.

Group II, the adopting industry concentrates on the banks, building societies and retail groups. Assuming that a new bank card technology is developed, the members of this group

conceivably have the greatest responsibility in bringing it to the market at the best time and in the most suitable format - interfacing a new system with existing ATM and EFTPoS hardware is not an 'overnight' task. Does the concept of a new bank card technology provide positive enthusiasm?

Group III which I term the 'market', consists of what should be the most important component within the innovation model - the consumer. There is an argument that states that 'the customer is always right'. Can the consumer choose or at least have some involvement in choosing what alternative bank card technology should be introduced, and when and how it should be interfaced with existing technology? Is the consumer expected to pay higher bank charges for the privilege of probably receiving no direct benefit. In principle, what is in it for the consumer?

Group IV consists of other more 'remote', although still significant 'actors' and perhaps the most influential in the long-term. The focus is on the media, central government and experiences in other European countries. The prospect of national ID identity cards being introduced in the United Kingdom is more conceivable every day, even though various organisations claim that it would be an infringement of civil liberties. How does this affect bank card technology? Should central government be involved in the development stage, and if so, how much control should be attributed to the Data Protection Act? Should central government take a pro-active role in co-ordinating bank card activities in the United Kingdom - the French government did during the mid 1980s. The data used for evaluating the actors in Group IV are the result of an on-going literature review together with a series of interviews.

The need for the development of standards is identified, which is multi-dimensional in terms of the geographical and subject matter. These standards should cover every aspect of the bank cards including hardware specifications, data formats, operating systems, encryption algorithms and the use of the card outside the United Kingdom.

Bank card technology has changed little since the first bank card was introduced by Diners Club in 1962, followed by American Express and Barclaycard a few years later. This small item of 'plastic' has perhaps ultimately become one of the determining objects of material

success, and still consists of a rectangular piece of polyvinyl chloride acetate (PVC) measuring 85mm x 54mm x 0.76mm. The secure elements continue to be a hologram, signature panel and magnetic stripe which retains confidential information such as the card holders account number, sort code, name and PIN. However, increasing doubt is being placed on the long term exploitation of existing bank card technology and the present systems associated with reading card holder and transaction data. This thesis identifies the various alternatives that are being proposed by the different organisations within the Retail Banking industry. Alternatives suggested fall into two areas, which should not be treated separately since they all contribute to the system.

The first area is that of the magnetic stripe and the alternative methods of storing potentially more data with increased security - Watermark, XSec Security, Holomagnetics or Optical Card. Each of these alternatives are reviewed, together with the option of adding biometric security. The various cost advantages and disadvantages are considered with the long term requirements of the adopting industry in mind. Specific aspects for consideration include Card Cost, Security, Durability, Cost of Upgrading ATM and EFTPoS Hardware, Data Capacity and Relative Maturity. Other considerations include that of improving existing procedures and systems which are already in place in some banks and retailers. This could involve sending bank cards by recorded delivery, improved checking of bank card details at the point of sale and more on-line systems for intercepting lost or stolen cards.

The second area concentrates on the introduction of Smart Card technology as the alternative. The many different permutations of IC and memory varieties, of operating systems and algorithms may seem bewildering, but there is nothing very complicated about a microprocessor imbedded within a standard size piece of plastic. Smart cards are supposed to offer the best choice of requirements in terms of security against fraudulent use, a larger data capacity and ease of upgradability.

As one senior consultant said recently 'smart cards are an idea whose idea has come - and nothing can be more powerful' Banerje et al (1995).

## Background - Previous Research

There have been earlier studies on related topics and this section introduces key literature on innovation in the finance and retail sector and bank card fraud. In his paper *'Interactive Innovation in Financial and Business Services: The Vanguard of the Service Revolution'* published in 1989, Richard Barras refers to the 'Reverse Product Cycle' innovation model. Barras suggests that

'firms within the adopting industry [Retail Banking] must operate in an uncertain and changing environment, matching the known possibilities of the available technology with their perception of evolving needs and demands within their product markets and the actions of their competitors'. (1989, p224).

Barras goes on to say that both technology push and demand pull factors are equally important influences on innovation within the financial and business services. This supports the opinion that proponents of one model over the other are inevitably taking only a partial view on what drives innovation in retail banking.

Nathan Rosenberg and David Mowery have made many contributions to the field of innovation and technical change. In one influential paper, *'The Influence of Market Demand Upon Innovation - A Critical Review of Some Recent Empirical Studies'* (1979) we find some 'text-book' examples of innovations resulting from market-demand. In tandem with the work carried out by Barras, this paper stresses that both demand and supply side influences are crucial to understanding the innovation process. Some critical implications of the criticism for government policy towards innovation are discussed in the conclusion of their paper.

*'Banking on New Technology: Choices and Constraints'* was published in 1987 by David Wield and Steve Smith. Their paper examines the implications of recent and future technological changes and choices for the banking industry. One conclusion from this paper is that although the technology appears to be revolutionary, the reality is less so. Indeed, few in the adopting industry would argue that smart card technology has been looking for applications since it was first developed during the 1970s - and yet the media components suggest that the smart card technology has just arrived.

In his paper '*Competition in Retail Banking*' (1982), F W Crawley, at the time the Deputy Chief General Manager of Lloyds Bank, analyses the reasons for increased competition in retail banking, emphasizing the willingness of the banks to respond to the changing requirements of their customers. A similar approach is carried out by Shelagh Heffernan in her paper '*New Technology and Competition in British Banking*'. This paper, although written in 1983, considers the earlier technological changes in the EFTPoS scene, and is still relevant since it discusses whether these innovations will enhance the ability of a bank to penetrate a particular market territory. Related to this is the issue of whether new technology changes the structure of the fixed costs associated with a particular bank service and how this affects the competitive behaviour of the bank.

Dr J Howells has published a number of papers on the bank vs. retailer relationship. Two working papers which have been considered in the context of this thesis is '*The Design of EFTPoS And The Bank-Retailer Relationship*' published in 1991 and '*The Interaction Between Competitive Strategy and the Implementation of a New Network Technology and The Case of EFTPoS in the UK*' published in 1990. Dr Howells worked with Dr Jim Hine, a fellow researcher at the University of Edinburgh, and Dr N Alexander. They carried out interviews with a selection of banks and retailers to evaluate the work of EFTPoS' UK and the 'power struggle' between both groups of organisation in agreeing the technical features of EFTPoS in a real application. A strategic map of EFTPoS development was proposed, together with a model illustrating the interaction between retailers both during and after EFTPoS' UK in the mid 1980s. This model suggests that before EFTPoS' UK, the banks and retailers operated as single partnerships, with only one bank clearing transactions for each separate retailer. During the later half of the 1980s, many UK retailers were acquiring a knowledge of electronic payment systems independently of the banks. In addition to the increasing competition between the banks, this resulted in the single loyalty approach becoming less important as multiple acquirership took over.

The combined effect of competition and cooperation between the banks and other financial organisations will strongly affect the development and introduction of new bank card

technologies. In his book, Alec Cairncross provides the following definition of competition

**'Business competition is fundamentally the offer of a substitute. Business competition is rivalry in selling among producers acting independently, their effort is to win customers from rivals, to grow, to undersell and to get a larger share of the market' Cairncross (1991).**

During the 1980s there was a great deal of market activity in the retail banking sector.

Ian Lindsey of the Save & Prosper group suggested during a telephone interview that

**'...this activity was not competition among the high street banks, but competition by newer entrants to the market - the smaller branchless banks and building societies. Contrary to the conventional definition of competition, the attack came from people who were fundamentally not in the same business as the main producers!'**

Within the banking sector generally, let us briefly consider what Lindsey is referring to. During the period 1980 to 1984, the smaller banks, without the overheads of maintaining branch networks entered the personal banking market by offering interest bearing accounts and cheque books to customers who maintained more than average balances in their accounts.

Initially the larger high street banks (Barclays, NatWest, Midland and Lloyds) did not respond to this competition. The Building Societies, traditionally only active in providing mortgage and savings accounts, then very quickly entered the market, with the Nationwide, Halifax and Abbey National probably taking the lead - the Nationwide claim that they 'opened over one million Flexaccounts during the first twelve months'.

This Building Society activity reduced the short term deposits held by the High Street banks, who quickly counter-acted by offering customers interest on their current accounts. Whilst this counter-competition provided some support to their current account business, the banks suffered with the general movement of large savings deposits, especially as a result of the introduction of fixed interest accounts. Current accounts are now becoming less attractive for the consumer because of increasing bank charges and falling interest rates.

From the perspective of the large banks, collaboration is viewed as a necessary evil. The investment in new technology, especially into such an enormous and increasingly complex

market place where the present system has been in use for over twenty years, is a sizable undertaking, even when there are collaborative agreements on overall standards and systems. However, collaboration between banks has not been without considerable tension and conflict.

David Everett of Mondex'UK, a collaboration between Midland Bank, Natwest Bank and British Telecom, summarizes the banks position as follows.

'We [the banks] are all slightly different and will argue for years and get nowhere. Do you want a repeat of EFTPoS'UK ? We believe in competing and collaborating and Mondex will share our technology and experiences with any other bank so long as they do NOT abuse our patents and copy our products directly'.

Marks and Spencer plc. is considered nationally by both consumers and other retailers, to be one of the headline success stories of the 1980s. In his chapter *'Marks & Spencer: A technological approach to Retailing'*, Braham (1985) considers M&S as a catalyst in what can be regarded as a 'pull-through technology'. Braham suggests that M&Ss pre-eminence as a retailer has enabled it to set standards for much of the clothing industry. In 1993, M&S introduced a smart card based discount scheme for its employees, perhaps setting standards for other retailers to follow. The large retailers are key actors in decision-making that will determine the future of new card technologies, and Marks and Spencer's decision may be important, since it is a cautious technology innovator.

A further issue important in the shaping of new card technologies is card fraud. Understandably, card fraud is a problem that most banks and credit card companies are reluctant to talk about - while they are happy to publicise efforts to fight fraud, few are willing to admit to how much of a problem it really is. VISA International, whose turnover worldwide was US\$ 183 Billion in 1993, estimates that 0.08% of all its transactions in the United Kingdom are fraudulent - this figure is falling at the present time. Combined with cheque and debit card fraud, the total value of fraudulent transactions in the United Kingdom added up to £175 Million in 1993. Whilst the banks are content to write-off such losses, they know that the 'high-tech' expertise of criminals is growing, making it essential to stay ahead of the problem.



Bryan Clough highlights the growing problem of bank card fraud and the 'sharp' practises used by the fraudsters in what he terms, a very 'naive' system. During the past ten years, he has been involved with the supply, maintenance and security of computer systems and his publication *'Cheating at Cards'* (1994) concludes that there is now an urgent need for a reappraisal of retail payment systems. The book also gives evidence that whilst the bank's use of technology has allowed them to reduce staff and close branches, it has also served to alienate their customers.

Ronald Brown has published many papers on retail banking technology, many of which have appeared in his monthly publication *Post News*. His most recent contribution is a book titled *'Electronics in Retailing'*, a research report carried out in 1993 on EFTPoS systems, equipment costs, advantages and markets. This publication is a good source of reference material relating to the major companies providing hardware systems into the retail banking sector, and focuses on some of the systems aspects relating to the reduction of bank card fraud.

The Home Office Crime Prevention Unit was formed in 1983 to promote preventative action against crime. A series of reports have been published, each concentrating on one specific area of crime and of particular relevance to the work in this thesis is *'The Prevention of Cheque and Credit Card Fraud'* (1993) written by Professor Michael Levi, Paul Bissell and Tony Richardson. In their exploratory study they cover three main areas of research.

1. To develop a better understanding of the extent of cheque fraud, cheque card fraud and credit card fraud.
2. To examine how business and public policing have developed in relation to the various types of fraud.
3. To analyse which 'policing' methods seem to hold out the most and the least.

In addition to the core technologies listed earlier, the option of using biometric security is considered. Bob Carter is regarded as one of the industry experts on biometrics and has written a number of working papers, with particular emphasis on retail banking. In one paper *'Biometrics - Is it the right time'* (1995), Carter reviews what is available in the 1990s,

and which biometric, if any, can be taken seriously in this market sector. Both the physical and behavioural biometrics are considered in this paper.

There is considerably more research being carried out in the field of bank card technology and alternative technologies, following the growing publicity over bank card fraud. When my literature review began in 1991, there was a relatively small volume of published literature, produced by a small group of leading researchers. There is increasing evidence that this group is growing with a greater variety of discussion points and views taken.

### **Thesis Layout and Overall Methodology**

This thesis can effectively be divided into two halves, chapters one to four and chapters five to eight. In the first half, I introduce the adopting industry, relating it to the core principles of the innovation cycle and the process of 'market pull vs. technology push' with respect to emerging alternative bank card technologies.

Chapters two and three introduce and review the alternative technologies being considered for bank card use in two ways. Firstly, as a raw technology at the development stage and secondly, as an applied system, with respect to the EFTPoS terminal and ATM system. Bank card fraud is quantified and the methods used to defraud the system are introduced. The data capacity and subsequent opportunities for adding additional services to the bank card are also considered. The task of interfacing each alternative technology into the existing retail banking system is discussed throughout these two chapters, developing into the area of technology trials in chapter four. This chapter concentrates on the process of service refinement, listing the major bank card trials which have taken place during the last ten years. Although most of these are UK based, other significant worldwide trials are listed. Most of the data used in the first four chapters are as a result of my literature review carried out during 1991-1993. The data relating to the market players was gathered from industry sources.

Having set the scene, the second half of my thesis focuses on the major groups of players within the innovation model. Chapter five considers the technology supply industry. The data used in this chapter was as a result of a postal survey carried out in early 1994. A copy of the questionnaire is provided in Appendix I. A selection of manufacturers were also

contacted by telephone, to discuss the technologies being considered for detailed research and development. These are listed in Appendix II.

Chapter six considers what should perhaps be the most important group, the consumer. Taking a limited number of 1,017 Open University students located throughout the United Kingdom, I examine their spending habits in certain stores, and examine their views to different methods of payment at the retail point-of-sale using a postal survey carried out in 1992. A copy of the questionnaire is provided in Appendix I. There is an argument that 'the customer is always right'. Can the consumer choose or at least have some involvement in choosing what alternative bank card technology should be introduced, and when and how it should be interfaced with existing technology? Is the consumer expected to pay higher bank charges for the privilege of probably not receiving any direct benefit? What is in it for the consumer? Chapter six examines these questions.

Chapters seven and eight then concentrate on the banks, building societies and retailers, reviewing their attitudes towards each other and the consumer in a growing market. The case for alternative bank card technologies is taken up with a selected group of grocery fourteen retailers with annual sales ranging from £200,000 to £30,000,000. A series of telephone and face-to-face interviews were carried out during 1994-95, and the data from each contact used for further discussion in other 'windows of opportunity'.

The last and probably the most diverse group of influential organisations is considered in chapter nine, including the UK government, the media and developments in other EU countries..

The conclusions drawn at the end of my thesis point to the complex nature of the innovation process in retail banking, especially when selecting and nationally adopting a new bank card technology. Whilst my objective is not to make any finite predictions about the adopting industry during the second half of the 1990s, the thesis does confirm how changes may evolve and which organisations will be the most influential.

## **Chapter 1**

### **Recent Developments in Retail Banking Payment Systems in the United Kingdom**

There are around 28 million credit card holders and 26 million debit card holders in the United Kingdom. Payment by credit card provides the account holder with an interest free period before interest becomes chargeable, monthly, on the outstanding balance. Debit card payments are charged to a current account, and do not provide any form of credit to the consumer.

The sector showing the fastest growth is the debit card, with a growth in use (numbers of transactions) of 668% since 1989, rapidly overtaking the use of credit cards in the UK. The paperless wallet (electronic purse as defined by the industry) is becoming more likely every year, and the cheque book is being replaced by the credit card and/or debit card as people prefer to pay with ready cash or with 'plastic'. According to APACS (1994, p23), 78% of adults hold one or more financial cards and 1,675 million purchases were made with plastic cards in the UK alone during 1994. Card purchase volumes are forecast by APACS to increase by around 80% by the end of the century. How have the banking organisations evolved towards this point and how have these changes evolved? In this chapter, the UK electronic banking system will be introduced, highlighting the key events which took place from the 1960s.

#### **1.1 Beginnings of Retail Banking and its' Developments**

Money plays such an important part in almost every part of our lives, that it is difficult to imagine how the process of bartering could ever work, and still does in many parts of the world. The ancient practice of banking is probably older than that of coinage, with historical evidence showing that it has flourished for at least 3,300 years. Some of the earliest unquestionable evidence of banking operations dates from the 'Code of Hammurabi' established by King Hammurabi of the Babylonian Empire during 1728 - 1686 BC. The code contains some 150 paragraphs which deal with cases arising from loans, interest, pledges, guarantees, loss, theft etc., Initially, the process of banking functioned without the need for coinage, and the standard unit was defined as an established weight or measure of agricultural produce or some form of metal or alloy combination. The role of the 'banker' was to act as an intermediary, either to accept, or to make payments from one place to

another without transporting commodities over long distances. They did this by agreeing on an accepted unit of value transfer with payment being made by an exchange of liabilities.

Coined money containing gold and silver was later used as the instrument of transfer, because it did not rot overnight like agricultural produce - however the problem of secure storage and transportation persisted and other forms of exchange were considered.

King Charles I is partly responsible for the formation of the UK banking organisation, when in 1640 he seized about £200,000 worth of assets deposited by trading merchants for safe keeping in the Royal Mint. This prompted the merchants to find a safer place for their assets, thus persuading the goldsmiths to become their trusted bankers - they already had safe places to store gold and access to foreign currencies for overseas trade. The goldsmiths produced their own banking policies and by the end of King Charles II's reign in 1685, many of the techniques of modern banking were in common use.

During the 17th Century, easier methods for transporting money were introduced, such as letters of credit, bills of exchange and cheques, which were merely authorizations to transfer money. These authorizations gave money a new dimension, allowing it to exist both as a tangible asset (coinage) and as financial information (credit and debit transfers). The Bank of England was established with a Royal Charter in 1694 with its primary purpose for existing, to raise money for the Government from the banking merchants of London. Its initial capital of £1,200,000 was raised by private subscribers in less than one week and the proceeds effectively lent to the UK Government. The notes that the bank printed as receipts formed the beginnings of the 'fiduciary issue' and were backed by Government securities.

On a general note, The Bank of England remained 'privately' owned until the Government nationalized it in 1946. Today it remains the national and central bank for the United Kingdom.

During the 1890s, two major developments took place. First, the beginnings of electronic money was developed when the telegraph was used as a medium for sending and receiving transaction *instructions* from one part of the country to another. And second, 'country banking' began. This involved shopkeepers and trading merchants in the country offering

banking services as a subsidiary business. They took safe custody of cash and valuables, issued notes and made loans and with this process developed a very good sense of money judgement. They would keep some money for instant recall by their customers, lend some money for interest and make shrewd investments in business. The process of country banking was carried forward particularly during the period 1918-20 when the big five banks emerged, and in 1968, the last of the major restructuring processes that resulted in the 'big four' English banks now known as the clearing banks - Barclays, Lloyds, Midland and NatWest Bank plc.

Other types of banking institutions, namely the Building Societies and Savings Banks evolved and broadened their operations from the 1960s onwards to provide specific services to the community as a whole, such as providing affordable mortgage terms for increased house ownership and long term saving plans for retirement. It was not until the mid 1980s when certain organisations such as the Building Societies were permitted by an Act of Parliament [1988] to operate as a bank or 'securities house'. The Abbey National Building Society was the first Building Society to be converted to a bank in 1988 at the same time as becoming a Public Limited Company ('plc.>') on the London Stock Exchange. This bank status allows a larger range of services to be offered to the general public, including current accounts, share dealing, unit trusts, pensions, currency exchange etc.,

Smith & Wield (1987) discuss the technological changes within UK banking in detail, effectively dividing the developments in the 'retailing' operations of clearing banks into three clearly defined periods.

1. The late 1950s and 1960s - a period of extensive growth.
2. The 1970s - a period of more rapid technological and organizational change and competition with other banks.
3. The 1980s - a continuation of more rapid change and competition from other financial outlets, with some radical rationalization of branches and some intensification of work.

The British Bankers Association [BBA] in London, publishes the *'Annual Abstract of Banking Statistics'* during April/May every year. The BBA considers the eight largest banking organisations which account for over 70% of the UK Sterling banking business. Figure 1.1 gives basic data on these UK clearing banks.

**Figure 1.1 The Eight Largest Clearing Banks in the United Kingdom in 1994.**

	Number of Branches	Number of Staff	Number of ATMs	Total Assets £ Millions	Debit Cards	Credit Cards
National Westminster plc	2,545	72,200	2,815	152,862	S,V	V,M
Barclays plc	2,119	68,700	2,805	166,008	C	V,M
Lloyds plc	1,860	44,900	2,463	79,757	C,V	V,M
Midland Bank plc	1,713	42,400	1,938	76,431	S,V	V,M
TSB Bank plc	1,321	23,800	1,916	31,417	S	V,M
Abbey National Bank plc	686	16,400	964	83,802	V	V,M
Royal Bank of Scotland plc	752	18,800	787	36,294	C,S	V,M
The Bank of Scotland plc	455	11,400	406	28,809	C,S	V,M

Debit Cards include 'S' Switch, 'C' Connect, 'V' VISA Debit Card Scheme.  
Credit Cards include 'V' VISA, 'M' Mastercard

**Source: BBA (1994)**

The main clearing banks all have head offices in London or Edinburgh with numerous branches spread throughout the United Kingdom. The banks invested relatively early in computer systems. Particularly during the 1960s, large investments were made on mainframe computers linked to branch, back office terminals. Whilst the computer technology experienced many changes during the 1970s and 80s, particularly in the area of miniaturization and speed, many of the original systems are still in use during the 1990s. Several electronic financial settlement schemes are used in all the clearing banks which provides a standard method through which all credit and debit transactions are processed.

## **1.2 Bank Payment Clearing Systems and APACS**

There are four payment and credit clearing systems through which retail and business payments are cleared within the banking network. Three of these operate under the control of the APACS organisation and one is a separate organisation handling international payments and receipts.

### **1.2.1 APACS**

Within the United Kingdom, all three electronic payment systems, BACS, CHAPS and the Cheque and Credit Clearing Company are all collectively owned and regulated through APACS, the clearing banks jointly owned organization. The Association for Payment and Clearing Services (APACS) was formed in December 1985 by the major clearing banks as an organisation through which ideas could be shared with a fair amount of collaboration by all members. APACS addresses so-called non competitive matters at an industry level, such as leading the fight against bank card fraud and introducing new ideas on a national basis.

Various committees are organised to address areas of common interest between member banks, details of which are published in the APACS Annual Review. In June 1994, APACS had twenty one members consisting of UK banks and one foreign owned bank, Citibank. APACS publishes a regular newsletter *Card Watch* which reports to its' members about national campaigns against bank card fraud.

Membership of APACS or one of the three clearing companies is open to any financial institution which can demonstrate its' ability to meet the following criteria.

1. Being subject to appropriate supervision, broadly speaking, this means a bank or building society.
2. Being able to meet the technical, operational, and legal requirements of membership.
3. The maintenance of settlement account facilities at the Bank of England.
4. Accounting for at least a certain volume of items passing through the given clearing system - 0.5% for CHAPS and Cheque and Credit clearings and five million items for BACS.
5. In addition to criteria 1-4, in 1992, APACS extended membership to banks from other EU countries. This was principally to encourage discussion between the UK banking members and our European partners.



In June 1995, the twenty two members of the APACS organisation were as follows.

Abbey National plc  
Bank of England  
Bank of Scotland  
Barclays Bank plc  
Citibank N.A.  
Clydesdale Bank plc  
CO-Operative Bank plc  
Coutts & Co.  
Credit Lyonnais Bank (France)  
Deutsche Bank (Germany)  
Girobank plc  
Halifax Building Society  
Lloyds Bank plc  
Midland Bank plc  
National & Provincial Building Society  
NatWest Bank plc  
Nationwide Building Society  
Northern Bank  
Royal Bank of Scotland plc  
Standard Chartered Bank  
TSB Bank plc  
Yorkshire Bank plc

This thesis will identify APACS as being a dominant organisation shaping innovation in this market sector, bringing technological input together from different groups to propose alternative bank card technologies for future introduction.

### **1.2.2 Bankers Automated Clearing Service or BACS Ltd**

BACS was originally established in 1968 and became part of the APACS structure in 1985 as BACS Ltd. It is the inter-bank electronic funds transfer system which has operational centres located throughout the United Kingdom for processing the following types of monetary transfer.

1. Automated *Credits* for salaries, pensions and government benefits. Nearly 70% of the UK workforce is paid through BACS.
2. Automated *Standing Orders* for fixed amounts such as mortgage and hire-purchase payments and insurance premiums.
3. Automated *Direct Debits* for variable amounts such as utilities, community charges etc., Over 60% of UK households use the Direct Debit payment system.

It is widely recognised in the industry that BACS was not fully used until the early 1980s, mainly because of poor marketing and adverse publicity over the acceptability of automated Debit payments. A long term publicity campaign using television commercials and newspaper advertising is slowly changing the consumers perception of direct debit payment systems.

### **1.2.3 Clearing House Automated Payment Systems or CHAPS**

CHAPS was introduced in the United Kingdom in 1984 to offer a virtually instantaneous settlement system for all individual transactions within the UK over £50,000, most of which are transactions between the city of London banks. Overall responsibility is handled by CHAPS & Town Clearings Ltd operating under the control of APACS. Unlike the BACS system, CHAPS does not require large computing resources. Instead the system enables member banks to communicate payment information very quickly, via a high security switching centre which is operated by British Telecom. Payments of any value over £50,000 can be made across CHAPS, although the average value in 1994 was £2 million. CHAPS handles around 90,000 payments on peak days, with 40,000 payments on an average day. Every CHAPS payment is unconditional, guaranteed and cannot be recalled.

### **1.2.4 The Cheque and Credit Clearing Company**

The Credit and Cheque Clearing Company, established in 1960, operates the two bulk paper clearing centres which are situated in London and cover England and Wales. The cheque clearing centre handles most inter-bank cheques and the credit clearing centre handles paper credit items which are paid in over the counter or by post. Inter-branch items are dealt with separately by each member bank or building society. Cheques and credit drawn in Scotland and Northern Ireland are handled by clearing centres in Edinburgh and Belfast. On average, 12 million cheques and credits are cleared each working day, operating on a three day cycle. Cheque payment volumes reached a peak in 1990 and since then have fallen by over 10%.

### **1.2.5 Society for Worldwide Interbank Financial Telecommunications or SWIFT**

A separate organisation to APACS, SWIFT is a non-profit making cooperative based in Brussels, Belgium, used for sending payments between international banks. It is owned by the member banks, with shares allocated in proportion to the number of transactions sent

through the system each year. The cooperative was established in 1973 by a group of 239 banks from within Europe and North America and first went 'live' in 1977. By January 1994 there were 2,050 member banks from over 90 countries. SWIFT is a highly standardized system into which banks connect via one of the approved computer terminals known as SWIFT interface devices. Messages are passed in an encrypted format for obvious security reasons.

### 1.3 Payment Methods at the Retail Point of Sale

In the previous section, the technology and systems used for transmitting electronic and paper payments between banks were introduced. Our particular interest is the bank card technology used between the banks, consumers and retailers. How does the consumer pay for goods at the present time? APACS publishes annual statistics, which allow the following trends to be confirmed (figure 1.2).

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**Figure 1.2 Method of Payment at the Retail Point of Sale.**

Type of Payment	Current Usage	Relative Growth Rate
CASH	78%	Declining
CHEQUE	16%	Declining
DEBIT CARD	2%	Increasing
CREDIT CARD	4%	Stable

**Source: APACS (1993)**

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Let us consider each of these methods of payment. The first two involve the exchange of paper notes in the form of cash or cheques.

#### 1.3.1 Payment by Cash

This method of payment warrants attention to highlight the growing problem of counterfeiting, high cost of distribution and the growth of ATMs. Very little is reported about the actual amount of counterfeit paper sterling currency which is produced and distributed within the UK, possibly to avoid the potential loss of confidence in the monetary circulation system. The advancement of colour photocopying and associated Desk Top Publishing (DTP) techniques has resulted in the Bank of England constantly redesigning and

reprinting a new issue of paper notes every 5-6 years, in order to keep one stage ahead of the professional fraudsters. Various reports suggest that the value of counterfeit sterling currency in circulation is in the order of £150,000,000 within the UK alone. Another important consideration is the cost of distributing money or 'cash' around the United Kingdom. This single expense, considering only transportation and security expenses, is estimated to cost the banks around £2.5 billion and the retailers £2 billion each year. In relation to the average losses due to bank card fraud, about £170 Million each year during the period 1990 - 1994, these costs would appear astronomical.

Many consumers use an ATM (Automatic Teller Machine - the industry name for a cashpoint or cash dispenser) to withdraw cash from their account on a regular basis, more rarely writing cheques or using a credit or debit card. Ever since the first UK bank, Barclays Bank, unveiled the first ATM or cash dispenser at its Enfield, North London branch in 1967, the growth of ATMs has been phenomenal. There are three ATM networks (called MINT, LINK and FOUR BANKS) in the United Kingdom, to which each bank or building society has joined. The ATM network systems are listed in figure 1.3, together with a list of networked banks and building societies.

Each ATM costs around £20,000 plus installation costs in the UK and in 1993 there were more than 18,000 in this country alone with 350,000 worldwide. According to APACS, the ATMs in the United Kingdom alone paid out just over £50 Billion during 1993, the average transaction being £48. APACS confirms that 'a typical customer uses his bank card for a cash withdrawal about twice a month'. An increasing number of machines are being introduced into third party sites, such as supermarkets, motorway service stations and British Rail and London Underground stations. The growth of ATMs in specific countries is detailed in figure 1.4, with the United Kingdom in fourth position for the number of ATMs per one million population.

There is evidence that ATMs are a mixed blessing for banks. For example, Card World Independent suggests that

'after years of knocking holes in walls to install ATMs and pushing their customers out onto the high street, the banks are realising that they have lost contact with their customers. ATMs may have enabled them to cut costs and slash the number of cashiers but as banks move into more commission-based services, they are considering how ATMs can complement other financial services and fit into their overall banking strategy' (1993, p47).

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**Figure 1.3 The Three ATM Networks in the United Kingdom.**

<b>'LINK' ATM Network</b>	<b>'MINT' ATM Network</b>	<b>'FOUR BANKS' ATM Network</b>
Abbey National	Natwest	Barclays
Bank of Scotland	Midland	Lloyds
Halifax	TSB	Royal Bank of Scotland
Alliance & Leicester	Clydesdale	Bank of Scotland
Girobank		
Co-Operative Bank		
Bradford & Bingley		
National & Provincial		
Leeds Permanent		
Woolwich		
Nationwide		
Yorkshire Bank		
Allied Irish		
Bristol & West		
Clydesdale		
Britannia		

**Source: G Boxall, Open University**

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**Figure 1.4 Number of ATMs Available to the Population.**

<b>COUNTRY</b>	<b>ATMs PER 1,000,000 INHABITANTS</b>
Japan	630
Spain	470
USA	370
UK	280
France	230
Germany	150

**Source: Anderson Consulting (1993)**

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This thesis will later describe research on consumer issues, which revealed from my sample that over 62% of the sample used a cashpoint machine at least once a week. It also highlighted consumer worries regarding ATM phantom withdrawals.

### **1.3.2 Payment by Cheque**

In 1990 alone, over two billion cheques were issued, the vast majority being processed through the banks cheque clearing system. Following a steady increase since the clearing system was first introduced, the number of cheques issued has stabilised by 0.25% since 1994. In the early days of banking when cheques were uncommon, officials of each bank used to meet every day to exchange each others cheques in a public house in Lombard Street, London. As the use of cheques increased, this system of exchange became inadequate. In 1933, the Bankers Clearing House was established to facilitate this central daily exchange of cheques and to provide a mechanism for daily settlement. Although this century has seen cheque volume increase enormously and a banking system transformed by EDI (Electronic Data Interchange), the cheque clearing system itself has hardly altered and the building in Lombard Street is still the focal point for all activity.

The cheque clearing process is complex, taking about three working days for a cheque to clear through the clearing system. The reader will appreciate this process through the following example, which is used to identify the detailed operation involved.

#### **DAY ONE**

1. The goods are purchased and a cheque passes from the consumer to retailer.
2. The retailer pays the cheque and all others received as payment into its own bank account. The retailers account is credited although the transaction will not be cleared for about three days.
3. The retailer's bank sorts all the cheques received that day into batches according to the issuing bank. All Midland plc cheques are batched together, all Lloyds plc cheques are batched together etc.,
4. All the cheques not belonging to that particular branch are sent by overnight courier to its own banks' clearing department in London to arrive the next day.

#### **DAY TWO**

5. The clearing department of each bank receives batches of cheques drawn on each of the other clearing banks as well as cheques drawn on each of their own branches. The batches are amalgamated and despatched to the Central Clearing House in Lombard Street, London.

6. Representatives of all the clearing banks are present at the Clearing House when the batches arrive and effectively an enormous 'swap' of cheques is carried out between all the banks involved - about nine million cheques every day. At the end of this exchange process, each representative returns to their own clearing department with cheques only drawn on each of their own banks branches, for example Midland plc cheques only.
7. In the case of Midland plc, their clearing house receives all cheques drawn on Midland branches. The cheques are sorted into new batches according to branch and the information is stored on a computerised accounting system known as *truncation*, whereby cheques remain at the place of encashment but have their accounting details transferred electronically to the branch where the issuers account is held.
8. The new batches are sent by courier to the respective branch where the issuer's account is held.

### DAY THREE

9. The cheque arrives and the amount is debited from the issuer's account and is automatically cleared.

The introduction of the cheque guarantee card ensures that cheques are not refused payment at the time of clearing as long as the issuing bank's rules have clearly been followed by the payee or receiver. This guarantee is not on-line and therefore does not provide any protection to the bank against accounts which do not have funds available. It is estimated that the administration cost of clearing a cheque is about 90 pence per item.

#### 1.3.3 Payment by Bank Debit Card

The processing of debit card transactions is different in many ways to that of cheques and involves the use of an electronic EFTPoS (Electronic Funds Transfer Point of Sale) terminal. It is estimated from various sources, that there are approximately 250,000 EFTPoS terminals in the UK. A considerable amount of memory (battery backed RAM) is either built into the EFTPoS terminal or into a removable card. This is used to store the day's transactions and a 'hot-file' of potentially lost or stolen cards. The availability of terminals includes portable or hand-held units and desk-top units all of which can either be mains powered or quickly recharged for the next working period.

The debit transaction clearing process is relatively simple, although for consumer confidence reasons, transactions still take about three working days to clear through bank clearing system. The reader should appreciate that this process, though more simple than cheque clearance, is not without complexity.

#### DAY ONE

1. As the debit card is swiped through the reader, the account details are first checked against the card 'hot file'. A hot card is defined as a card that has either been reported lost or stolen, or for which payment authorization has been stopped. Each retailers terminal can store a 'floor limit'. If the transaction value is in excess of this limit, the terminal will automatically dial the relevant EDI network applicable to the card being used and obtain an authorization code for the retailer. Some of these authorisation codes take place by checking the account details against 'negative files' of cards put on 'stop' by the issuer and others work on a pseudo random basis, checking every nth transaction below the floor limit to check against fraud by customers or staff.
2. At the end of the day, the day's transactions are totalled by the terminal and printed out as a record and audit trail for the retail who then either takes the memory card and transaction slips to the bank, or more recently, down loads the transactions through a modem.

#### DAY TWO

3. From here the process is very similar to that of cheques, although simplified. The clearing department of each bank receives batches of electronic transactions. As authorisation has already been provided for every transaction, the payment can be made to the retailer with immediate effect and the 'clearing' process is complete. Having credited the retailer's account with each transaction, the batch of transactions are electronically sorted into payments from one bank, for example Midland plc payments only.
4. These payments are sent by modem to the respective bank where they are processed and sent to the respective branch where the debit card holder's account is held.

#### DAY THREE

5. The payment details arrive and the amount is debited from the issuer's account with full details of the payment being stored on the account.

There are many trademarks given to the types of debit cards available, which all use the same technology although different data processing networks - ie. they are not compatible with each other. The *Barclays Connect Card* - Barclays Bank launched the 'Connect' debit card in May 1987 with a great amount of publicity, particularly because of the 2%



transaction charge which the bank attempted to impose at the start of negotiations. The 'go it alone' launch of this card was the possible reason for the break up of the twelve members of EFTPoS'UK (discussed further on page 33). By December 1987, with the pending launch of the competitive 'SWITCH' debit card, Barclays reached an agreement with the retailer associations that the Connect card will charge the retailer a flat rate of 17½ pence of a transaction's value. By 1992 and at the present time, the transaction charge is negotiable between each bank and retailer depending on the average transaction and annual sales turnover. The Connect debit card is now accepted and issued by Barclays Bank, Lloyds Bank, The Royal Bank of Scotland and The Bank of Scotland.

**The VISA Delta Card** - The 'VISA' delta debit or payment card was first launched by Lloyds Bank in June 1988. Lloyds promoted a new card strategy for its customers in suggesting that '.....if its Credit then it's Mastercard, if it's Debit then use VISA' [Lloyds Bank, 1989]. This strategy continues to cause confusion for both consumers and retailers with Mastercard supporting both debit and credit card payment systems. The VISA payment card is now accepted and issued by Lloyds Bank and the TSB.

**The Switch Card** - When it was first launched in October 1988, jointly by Midland, NatWest and The Royal Bank of Scotland, the 'Switch' debit card was seen as a major competitive threat to the 'Connect' debit card. Having learnt from the experiences of Barclays Bank as they introduced the Connect debit card, the Switch debit card moved forward at a faster rate of progress but, as expected, has not been without a fair amount of controversy. In 1990-91, Barclay Bank applied to join the scheme. This was as a result of the bank recognising a few problems with its own merchant acquisition capabilities - they could not offer retailers the full acquisition of Switch, VISA and Mastercard transactions. Barclays Bank did not go far with their application, for the reason that the 'Switch Rules' required that prospective members should put their major debit card into the switch network, a commitment which Barclays bank had no intention of making. The situation remains unchanged. Switch debit cards are now issued and accepted by Midland Bank, NatWest Bank, The Royal Bank of Scotland, The Bank of Scotland and the Halifax Building Society.

### **1.3.4 Payment by Bank Charge Card or Credit Card**

The first type of Charge Card, introduced into the United Kingdom for the purchase of goods or services was the Diners Club card launched in 1951. It was intended as the latest way of paying for meals in restaurants and hotels and had a certain amount of esteem connected to it. The account holder settled their outstanding credit, in full, within an agreed period - usually at the end of the month. In 1963, the American Express (AMEX) charge card was introduced.

The first Credit Card was launched by Barclays Bank plc in 1966, and is still known today as the Barclaycard. Following the activities of Diners Club and American Express, the card was initially launched as a charge card, but after 14 months of operation, the bank changed its policy and permitted cardholders to carry the debt forward, paying monthly interest at an agreed APR (Annual Percent Rate).

In 1972, Lloyds Bank plc and National Westminster Bank plc launched Access which Midland joined later. Barclaycard and Access were eventually brought into an international framework when Barclaycard became a member of the US-based VISA group and Access became a member of the Mastercard organisation in 1977 and 1979 respectively. This introduced the significant advantage that both credit cards could be used overseas.

VISA and Mastercard now jointly operate the most widely recognised payment system in the world and whilst the two organisations compete to increase their own market share of personal credit card banking, there is an increasingly amount of cooperation to reduce bank card fraud and to introduce new card technologies and consumer services to increase potential income. In 1994, VISA and Mastercard between them worldwide had 35,000 member institutions, 20 million merchants accepting cards and more than 3 Billion issued cards - confirming their overall dominance of the credit card payments market.

EUROPAY are a European organisation similar to VISA offering a membership scheme for both debit and credit cards to member banks. In March 1994, they were not active in the UK because of the dominance of Switch, Barclays Connect and VISA delta, although are commonplace in France, Germany and Italy.

Each organisation effectively has *member* banks or financial organisations who are permitted to act as Card Issuers and/or Merchant Acquirers. Within this operation, the member bank is able to earn revenue through two sources.

- |                          |   |
|--------------------------|---|
| <b>Card Issuer</b>       | <ul style="list-style-type: none"><li>- Supplies a credit card to the Consumer / Account Holder.</li><li>- Annual fee for providing a credit card facility.</li><li>- Interest is charged on accounts which are not regularly cleared.</li></ul>  |
| <b>Merchant Acquirer</b> | <ul style="list-style-type: none"><li>- Supplies a EFTPoS terminal to the Retailer, charging a one-off or monthly fee.</li><li>- Per transaction fee charged to the retailer for processing each transaction, either a fixed charge, 50 pence each transaction, or typically 3% of the transaction value.</li></ul> |

The processing of credit card transactions is very similar to that of debit cards and involves the use of an electronic EFTPoS (Electronic Funds Transfer Point of Sale) terminal. Either built-in to the terminal or as a removable card is a considerable amount of memory (battery backed RAM) which is used to store the days transactions and a 'hot-file' of potentially lost or stolen cards. The availability of terminals includes portable or hand-held units and desk-top units all of which can either be mains powered or quickly recharged for the next working period. Transactions are charged to a different credit card account and a monthly statement sent to the account holder for settlement in due course.

### **1.3.5 Payment by Store Card**

Whilst this thesis does not focus on this form of payment, it should at least be introduced for a variety of important reasons. Store cards were initially introduced during the early 1980s by the larger retailers such as Debenhams, Marks & Spencers and British Home Stores as a means of increasing sales through greater customer loyalty. Using either a paper voucher system or the same electronic EFTPoS terminal for processing debit card and credit card transactions, the store card data is collected in an identical manner to bank cards. The data is then handled either by the stores financial services division or by a third party agent, such as Welbeck Cardholder Services, who charge the store a nominal handling charge for processing the data and monitoring customers accounts.

Keynote (1993) estimates that there are around 11 million store card holders in the UK, a number which is steadily increasing as the retailers introduce a range of customer loyalty schemes. These are used to tempt customers back to the store having collected points to use for future spending, and there are now many IT systems in place to compile mailing and promotion lists to increase direct or indirect sales. Direct sales are increased by offering the card holder special offers of merchandise, privileged shopping trips, product promotions and special discounts. Indirect sales can be enhanced by selling customers financial services such as insurance, savings plans, long term loans and maintenance contracts. With the potential use of alternative card technologies for payment cards, the number and range of customer loyalty schemes are increasing throughout the retail industry. There is also increasing collaboration as loyalty schemes are shared between different retail groups, for example the Total Oil 'TOPS' card with points redemption in Boots the Chemist or Marks & Spencer.

## **1.4 The Fraud Issue**

Fraud is a concern of everyone involved in the adopting industry - from the consumer, back through the supply chain to the technology supply organisations. Bank note fraud and the different types of bank card fraud are considered, highlighting the limitations of the existing security features on bank cards.

### **1.4.1 Bank Note Fraud**

Data published by both APACS and the Central Statistical Office provide some important facts. Cash accounts for over 78% of spontaneous purchases, one in seven working people are still paid in cash and over £1.2 billion is withdrawn from ATMs in the UK every week. Counterfeiting statistics are not usually published because of public confidence. The Bundesbank in Germany is the only financial organisation worldwide, to actually publish counterfeiting statistics within its annual report. The five years during 1989-1993 are provided in figure 1.5 to illustrate the staggering six-fold increase during this period.

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**Figure 1.5 Counterfeit Bank Notes in Germany.**

<b>Fiscal Year</b>	<b>Number of Deutch Mark Notes</b>	<b>Value (DM.)</b>
1989	3,425	304.00
1990	4,120	327.00
1991	6,632	754.00
1992	14,057	2,520.00
1993	41,838	5,732.00

**Source: Bundersbank Annual Report, Germany.**

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According to the Bundesbank, this agrees with trends elsewhere in the EU. Since not all notes are discovered, the actual value is probably much higher. Many designs of bank note include extra security features such as the use of fluorescent paper, optical marking which is visible under a UV light and embedded stripes. In the UK, the £20 note is the most likely to be counterfeited according to the Bank of England, followed by the £50 note, to the extent that more retailers are deciding to reject high value notes. De La Rue plc., (a bank note manufacturer) and Portals plc., (a bank note paper manufacturer) who merged in 1994, are the largest suppliers in the EU. They claim that new security features can only be developed with finance provided by governments and that it is becoming increasingly difficult to stay one step ahead of the fraudster, particularly the 'professional' cartels. The publication *Fraudwatch* suggests that massive volumes of counterfeit banknotes are being made in countries such as Iran using government owned printing factories, apparently with government backing. Fraud is helping to push innovation forward. The next generation of bank cards and in particular the electronic purse, may help to eradicate this growing concern.

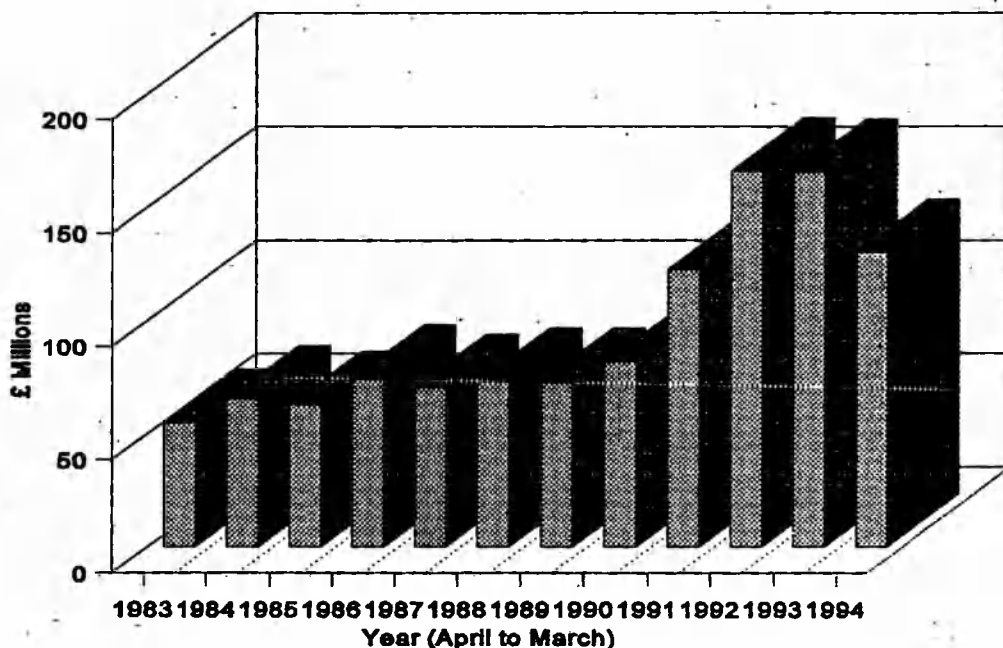
#### **1.4.2 Bank Card Fraud**

We read in the press every week, that according to the banks and buildings societies, their ATM systems are fully secure and cash can only be withdrawn by the cardholder or if the cardholder has allowed his card and confidential PIN get into the wrong hands (intentionally, or accidentally lost or stolen). How are bank cards used to defraud the card holder?

### 1.4.3 The Size and Type of Bank Card Fraud

The trends in bank card fraud are illustrated in figure 1.6, data supplied by the BBA.

**Figure 1.6 Bank Card Fraud Losses in the United Kingdom 1983 - 1994.**



**Source:** BBA (1994).

In June 1991, the Home Office Crime Prevention Unit carried out an exploratory study of the methods and numbers of fraudulent cheque and card losses in the United Kingdom. Their findings were published in a paper titled *'The Prevention of Cheque and Credit Card Fraud'* (1993) and highlighted the types of bank card fraud described within the following pages. Where do fraudsters get their bank cards from? A survey carried by Barclaycard in 1992 suggested that 49% were stolen, 28% lost, 17% intercepted through the postal service and 6% were counterfeit. Where do fraudsters use these bank cards? The same survey by Barclaycard suggests the following types of retail outlet; clothing 12%, motoring 13%, supermarkets 23%, ATM 4%, cash drawn by cheque over the counter 8%, restaurants 4%, DIY 5%, mail order 3% and other retailers 28%.

### *Postal Interception*

The problem of postal interception was highlighted as a major problem by the home office report. Card production and distribution to the banks and building societies is very secure.

However, once a bank card is sent through the postal service to the card-holders home address, the financial loss arising from non-receipt varies as a proportion of total fraud losses from 8% to 67% for different issuers. One bank (not identified) stated that approximately 12,400 cards were lost in the post during 1990 alone. As the cards are unsigned and are probably the easiest cards for the fraudster to use, these cards sustain the heaviest losses. Once intercepted, the fraudster can sign the card with a repeatable signature of the name embossed on the front of the card and use it for perhaps 5 days or more, depending on how long it takes for the account holder to recognise a problem with the account.

Obtaining the card holders PIN is relatively straight forward. Whilst the fraudster can look over someone's shoulder to discover a PIN as it is being entered into an ATM, the simplest method is to phone and ask the card holder direct. Posing as a bank employee or as a police officer phoning to confirm that the lost bank card (and a wallet or purse) has been found, it is explained to the card holder that the card has to be 'stopped'. To do this, the PIN is required and the card holder proceeds to give the PIN away believing that the bank employee or police representative has apparent authority and can only help in a hopeless situation.

### *Theft from Property or Person*

Bank cards are usually stolen by muggers, pickpockets, burglars and prostitutes, many of whom steal to order, passing the cards on for circulation through the criminal fraternity.

Despite requests by the banks and building societies, there are still many customers who

1. Take many days to report lost or stolen cards.
2. Write their PINs down and keep it with their ATM card.
3. Keep their cheque books and guarantee card together.

Despite the continuous publicity surrounding bank card fraud, the general public are still careless, leaving wallets and hand bags in car glove compartments overnight and leaving personal belongings in the staff meeting room.

### *Fraudulent Bank Card Applications*

One principal method of obtaining bank cards for criminal use is through fraudulent bank account applications. The procedure is generally used by professional criminals. A fraudster completes the application for a bank account using the particulars of another person, the details of which are taken from a stolen driving licence or some other similar document. The details used may also be of a recently deceased person or somebody who is known to be away for a period of time, either relocated on business or on a long term holiday for example.

In these circumstances, the fraudster usually arranges for their post to be redirected to another address or P O Box for card interception.

When a completed account application is received by a bank or building society, a credit reference agency is used to check the validity of the information and confirm that there is no outstanding debits. In an attempt to amend this situation, the CIFAS (Credit Industry Fraud Avoidance System) was conceived by the Consumer Trade Association. This system allows all member organisations to exchange details of fraudsters as they are discovered.

At a cost of £80,000 to each member, the CIFAS saved around £11 million during 1990, £19 million during 1991, £25 million during 1992 and £32 million during 1993.

### *Merchant Collusive Fraud*

A reducing method of fraud is known as 'Merchant Collusive Fraud' which involves a joint effort by both the 'professional' fraudster and a dishonest retailer. In the normal course of lawful trading, retailers (or merchants) sign up with one of the credit card acquiring networks and agree to pay a proportion of the transaction value as commission. During the 1970s, the process involved embossing blank plastic cards with false but convincing account details and imprinting this information onto credit card vouchers. These were passed through the clearing process on the basis that the retailer had accepted them in good faith, supposedly checking the signature and identification of a non-existent customer. Now, the process involves producing more than one transaction of the same card each time the card is presented, the card holder then claiming that he has only passed one transaction at the POS.

This method of fraud is quickly reducing with the introduction of EFTPoS and on-line credit authorization. It becomes harder to control this method of fraud within larger retailers involving individual members of staff. These individuals receive money from fraudsters in exchange for information about in-store bank card floor limits or for allowing the use of obviously stolen cards without the risk of apprehension. During the course of my research,



one retailer in East Sussex (not wishing to be identified) confirmed that they had been approached by a bank card fraudster for approval to operate with stolen cards in exchange for a commission on the profits. The approach was open and was during normal trading hours within the retail outlet, a large national chain of stores.

### *Counterfeit Bank Cards*

Counterfeit bank cards are probably the biggest medium-term concern to the banks and building societies. The number of counterfeit cards produced each year is growing, and the processes used becoming more convincing to both retailers and bank staff. With an increasing number of 'affinity' cards, being issued by virtually every type of organisation. A spokesperson from *VISA International* in London confirmed that 'a concern is the increasing number of counterfeit cards appearing from Nigeria and the Far East, in particular Hong Kong'.

In chapter three, we will consider some alternative bank card technologies which could contribute to reducing the financial losses due to fraud. Each of these technologies has disadvantages as well as obvious advantages.

## **1.5 EFTPoS 'UK**

During the last fifteen years there have many instances where different organisations, whether banks, building societies, retailers or technology suppliers, have collaborated with a few key objectives. One bank technologist explains that collaboration

' is a way of exchanging data with your market rivals. None of the banks can possibly afford to go entirely on their own in the EFTPoS scenario - you have to cooperate in order to move forward (personal communication, 1994).

Costs are shared and views on national and international standards are considered. Due to increasing tension between competition and collaboration, many 'consortiums' were formed during the early 1980s, to exploit the possibilities of EFTPoS. A few examples include the following:

Clydesdale Bank and British Petroleum:

'First' on-line EFTPoS network with 55 terminals, in 1982.

Barclaycard, Access, Amex, Diners Club:	'First' EFTPoS system with a telephone authorization facility.
Anglia Building Soc., and De La Rue Fortronic:	New EFTPoS terminal in 1984.
Barclays Bank and NCR (now AT&T):	New EFTPoS application at Euston BR Station in 1985.

Few would argue that the largest single banking collaboration is probably EFTPoS'UK. A complete book could be written on the activities within the organisation, but we will concentrate on the key principles which are related to this thesis.

The UK banks first considered the idea of EFTPoS during 1974-75 when the Committee of London Clearing banks (CLCB - replaced by APACS in December 1986) approached the British Retail Consortium to consider the possibilities for a national EFTPoS system. Following many years of discussion, a report was produced in 1980 confirming that 'the system' was considered 'too centralized, expensive and commercially restrictive'.

Many independent trials appeared during the period 1982-86, four of which were mentioned on page 33. Whilst many ideas were developed and new alliances formed, none immediately led to the direct implementation of EFTPoS throughout the UK. Cheque clearing was costing around 50 pence per item and the ideal EFTPoS transaction was estimated to cost around 18 pence per item, but in order to achieve this saving, the overall initial investment was to be billions of pounds. In September 1986, the banks set up an EFTPoS strategy review committee whose main objective was to guide the national implementation of EFTPoS through to completion. By April 1987, the committee had changed its name to EFTPoS'UK Ltd. The organisation was jointly owned by all member banks, all of which would have equal voting rights.

One member bank of EFTPoS'UK described the organisation as

' the whole concept from 1986 onwards at EFTPoS'UK was based on two words which were said to be able to be aligned - COOPERATING and COMPETITION. It was this element of cooperation which gave the environment the atmosphere - you know, the culture of prep school.... there was a degree of clubbery in this and that was the cooperative side.....we don't all like each other all of the time but there has long been an acceptance of alliances so that we always

divide evenly. We always manage to get a balance'. Howells et al (1991)

The need for EFTPoS'UK was paramount. By bringing the banks together in this manner, both technical and commercial ideas could be openly discussed and debated to provide the best possible long term national EFTPoS solution. Or could they?

The cooperative approach to implementing a national EFTPoS system was progressively eroded over the life of EFTPoS'UK (September 1986 to August 1990). It became a matter of competitive advantage to be the bank that had the strongest connections to the retailers. Barclays Bank was probably the first to break the 'club rules' in May 1987 when they introduced the Connect debit card, even though the other member banks had already finalized the details of a unified debit card scheme for ALL banks to adopt.

This move by Barclays Bank brought about the joint move by Midland, NatWest and the Royal Bank of Scotland when they introduced the Switch debit card, and as a full consequence probably the beginning of the end of the EFTPoS'UK organisation. Being relevant to the future of card technologies, retailer attitudes were important throughout the whole of the EFTPoS'UK organisation. As Howells et al suggest in their paper

'the retailers simply did not trust the banks when the banks claimed that the competition allowed for in EFTPoS'UK would benefit retailers. They assumed that some kind of extended duopoly would be used to pass the expense of the technically sophisticated national scheme on to themselves' Howells et al (1991)

In many ways they have been proved right, with the increasing costs of EFTPoS terminals during the early 1990s. According to the EFTPoS'UK proponents, the organisation was closed down because it had achieved its objectives. According to the antagonists, it had failed to fulfill its primary task; a single national EFTPoS clearing system. In November 1990, a financial reporter suggested in the FT that

'...both sides were right. The problem is that one of the effects of the EFTPoS'UK organisation was to make all the banks look alike to the customer - this makes it less possible for the more aggressive banks to compete for new customers'.

Throughout this thesis, the reader should consider the Competition ↔ Collaboration equilibrium as an important balance within the activities between all parties, the banks, retailers and technology suppliers. Increasing evidence of this equilibrium is present in the

mid-1990s as the same organisations decide the most suitable process for introducing a new bank card technology. As the reader continues into the thesis, it will be found that very little has changed. There are still clubs within which all organisations 'openly' discuss the alternatives without giving too much information away to the competition. As for the retailers, they still do not trust the banks.

A representative of RMDP at a technology meeting [Smart Card Club] during May 1994 summarised their opinion with the following clear message to the banks and retailers.

'You must be sure that you are delivering a real benefit to the retailer. They remember the past as the fiasco of EFTPoS'UK during the late 1980s. There is a backlog of bad feeling being passed onto the technology of smart cards and the revolution to come'.

In summarising this chapter, a few important issues must be identified.

1. The banks are gaining more power through the ownership of the national payment networks. This results in a tighter control over the UK retailers.
2. With new technologies being introduced, this will inevitably lead to increased costs in the medium term.
3. During the 1980s, the increasing use of ATMs, whilst reducing queues, resulted in the banks losing contact with their customers.
4. Although both the retailers and banking organisation are competing and collaborating together, this is becoming more fragmented with time.  
The experience of EFTPOS' UK remains in everyone's mind.
5. Fraud is a growing problem, as the fraudsters find ways of keeping up with the technology suppliers.

## Chapter 2

### The Innovation Process in Relation to the Adopting Industry

Is the process of innovation and the introduction of a new card based technology a linear process, in which the need is recognised and we set about finding a solution or device to fulfill that need? Many studies have been made during recent years, evaluating the process of innovation and the qualities of market research. There are various technologies that could be used for replacing existing bank cards. There have been many trials worldwide, each evaluating and identifying advantages and disadvantages for each technology. For example, as a result of some of these trials, there are some 6 million smart cards now being used for banking applications in France alone. In chapter two, I will identify the different agents who all have an important part to play in the innovative process for introducing a new bank card technology for retail banking. A model will be proposed, to illustrate the process of innovation and the interaction between each agent, using the smart card as an example.

#### 2.1 The Market Pull, Technology Push Scenario

Of all the ways of thinking about invention and innovation, the linear model is the simplest. It assumes that scientists make unexpected discoveries, technologists take them further and apply them, and engineers and designers turn them into new products and processes. This 'Technology Push' model assumes, for example, that nuclear physics produced atomic weapons and solid-state physics led to the transistor and microchip in a relatively straightforward process. Figure 2.1 illustrates this simplified model.

Like most simple models, this linear model for innovation starts to come apart as soon as you begin to research a few real cases. For example, it can be argued that the ATM was first introduced as a response to the bank's need to reduce the cost of administering paper transfers, reduce customer queues and increase turnover by offering a 24 hour banking service. Hence the ATM provides us with a technological solution for this 'market need'. How far back should we look for the science underpinning the laser technology used in the optical card drive or CD-ROM? Perhaps the early 1960s when the first lasers were developed or further back to when the underlying principle was first discussed -the stimulated emission of radiation and quantum mechanics!

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**Figure 2.1 The Linear Model of Innovation.**

**Pure Science** → **Applied Science** → **R & D** → **Manufacturing & Distribution**

---

These are just two innovations in which the linear process does not adequately explain their introduction. The unidirectional process of development from one stage to the next can constitute a possible theory which is easy to understand, although assumes a convenient linearity which in many cases is probably unproven and over simplified.

Professor Nathan Rosenberg from Stanford University in California, a leading economist of technical change, once opened a conference at the University of Sussex by saying that 'everyone knows that the linear model of innovation is dead!' Turney (1991, p35).

Mowery and Rosenberg conclude from their extensive interviews with large manufacturers that

'....the primary factor in only 21% of the successful innovations was the result of technical opportunity. Market factors were reported as the primary factor in 45% of the innovations and manufacturing factors in 30%, indicating that 75% of the innovations could be classed as responses to demand recognition' (1979, p108).

In Rosenberg's view, what is needed is effectively a road map to identify the most influential routes between science and technology, suggesting that every innovation uses linear logic, although with a number of interconnecting channels operating a process of feedback control.

This process is called the 'market pull' in contrast to 'technology push' and forms a two-way linear model with every stage in the development process being related somehow. Kline (1989) comes to a similar although more complex conclusion of a two way linear model with feedback loops, often referred to as the Chain Linked Model.

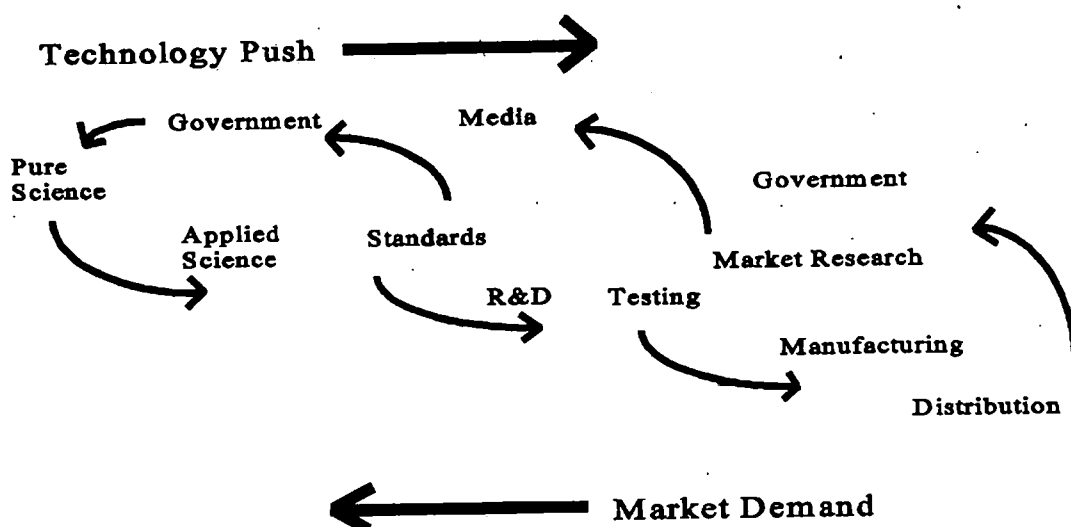
### 2.1.1 The Chain-Linked Model of Innovation

The chain-linked model emphasises the need for a highly interactive model where ideas can be developed at all stages in the innovation process. There are feedback loops to ensure that the final product or process is manufactured to provide a complete solution for a market's requirement. See figure 2.2 in which the left hand side of this model show the impetus coming from pure science through applied science into industry.

This model places a greater level of activity on market research and the feedback provided by the consumer. Briefly consider a few innovations which helps us to understand the different views on market pull.

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**Figure 2.2 The Chain-Linked Model of Innovation.**



**Source: Kline (1985)**

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Despite spending many millions of US dollars on marketing the Bull CP8 smart card and setting up worldwide trials during the mid-1980s to promote a cashless retail application, Bull Information Systems only started to make a profit during the early to mid 1990s. This is probably as a direct result of the use of CP8 smart cards being used in the French PTT telephone network and banking system - a specific market need for the product.



By examining other markets, specifically that of electronic consumer goods, we will widen our appreciation of the different processes of innovation. There are many organisations which have less regard for direct market research. If Clive Sinclair (Chairman of Sinclair Research) or Akio Morita (Chairman of Sony Japan) want to realise a new innovation, then in their view, market research is the enemy of successful design and innovation. Clive Sinclair claims that he did no market research before ordering 100,000 sets of parts for his first ZX personal home computer - perhaps working on a 'hunch'! He introduced the personal computer to the non-computer literate general public and sold in excess of two million terminals during the early to mid 1980s, before being acquired by Amstrad plc.

Roy and Wield (1989) consider the huge Sony Corporation in Japan, illustrating that even in the remarkably innovative Sony organisation, the story is the same. Chairman Akio Morita says 'whenever we come out with a new product, people say it won't sell'. Sony have had a successful history by ignoring results of direct market research - instead they claim the use of 'informal observation' or 'qualitative research' as a form of social forecasting. When the company launched its first small-screen television, their competition had concluded from their formal market research that there was no market for such a product. Yet Sony's television was an instant success, following a highly imaginative advertising campaign.

Another Japanese manufacturing company highlights the fact that the timing of a product launch is important when introducing new innovations, trying to place a moderate level of importance on market research. As a manufacturer of bank card readers for POS terminals and ATMs, at any one time Omron Tateisi Electronics is planning ahead by up to five years.

As one senior manager confirmed during an interview.

'We listen carefully to our sales organisations around the world. The design for new alternative products are always on the drawing board and it may be a number of years before a new innovation is introduced - only when we think the market is ready' (Personal communication, 1992).

The senior manager is stressing here the cautious approach with which many new innovations are introduced, and emphasises that in some circumstances, a premature launch could result in the reduction of sales of a current product line. In reality this is not always the case, because getting a new idea adopted, even when it has obvious advantages, is often

difficult. This process is described in many social science text books as the *diffusion of innovation*.

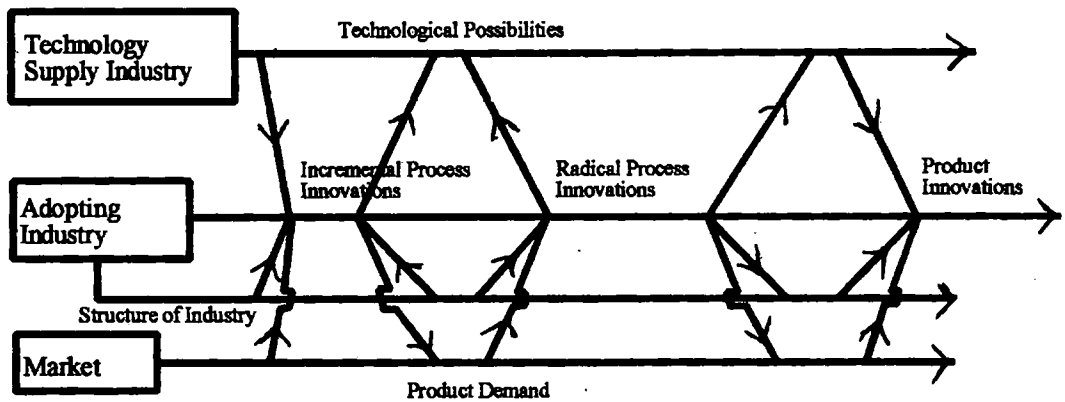
### 2.1.2 The Reverse Product Cycle

Barras (1989) in his research on technological innovation in retail banking, introduced a new and particularly interesting concept that is called the 'reverse product cycle'.

Barras argues that the service industries may adopt new technologies in the opposite direction to that experienced in the manufacturing industry. Instead of a dynamic process of innovation from product innovation to radical process innovations leading to lower level incremental innovations, Barras suggests that in service industries, the product cycle may be reversed. In this case, the smaller incremental innovations could result in more radical process innovations that effect complete systems change. This in turn results in new service products. Figure 2.3 illustrates the conceptual model of the reverse product cycle proposed by Barras.

**Figure 2.3 Interactive Innovation in The Reverse Product Cycle.**

**Source: Barras (1989)**



One example Barras uses in the adoption of information technology in banking, is the operating procedures of the large banks connected to SWIFT, the international payments systems described in Chapter one. As the banks in the adopting industry pursued progressively more radical innovations, the accumulated experience of the use of the

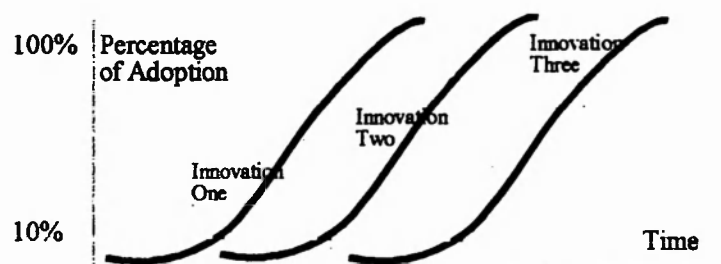
technology encouraged selective standardisation, both in terms of the specification of technical systems and the design of operating procedures to make use of them. The result of such standardisation was the tendency for the technological trajectories of different firms to converge towards one or more dominant designs. Barras suggests that while this standardisation considerably helped the speed of this innovation, it has also created a form of technological 'lock-in' which in turn slows down the rate of further innovation within the industry.

### 2.1.3 The Diffusion of Innovation and its relevance to Bank Card Technology

Figure 2.4 illustrates the diffusion process as an innovation which is communicated through certain channels over time among the members of a social group. With new products or services beginning to replace their earlier models as sales hit peak performance, somewhere around 60% of adoption.

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**Figure 2.4 Diffusion of a Product or Process over a Period of Time.**



**Source: Product Design and Technological Innovation, Roy & Wield (1989).**

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The diffusion process of innovation is active as five individual stages.

**Stage One - The Idea and its Evaluation.**

The rate of evaluation often depends on whether a new innovation is based on some already existing product or process, or is a totally new concept on which new patents are submitted by the 'inventor'. The latter is traditionally controlled by either the individual inventor or entrepreneur or the research and development department within a company or organisation. We can identify the inventor as having a creative mind with three realms of activity - the *inventive, artistic and rational*. It is rare for an individual to have all three subdivisions,

whilst a company may have three internal departments all dealing with some aspect of a new innovation. The 'Eureka!' effect when an individual thinks of an idea is often followed by an abstract or analytical approach to find out how feasible the idea actually is. Roy (1986) describes the five stage model of the creative process as i. First sight, ii Preparation, iii. Incubation, iv. Illumination, and v. Verification.

In the real world, the innovator will come across 'technology policies' which may have to be challenged or established patterns which are difficult to change. These may include ISO and/or BS product standards, as well as social views on specific technologies publicised through the media. Competitors may well be offering an alternative solution using a totally different principle - consider the alternative music systems [DCC vs. Mini CD vs. Standard CD] now available. If the process of innovation is based on an already existing product or service, the process of evaluation may be more complicated.

#### Stage Two - Communication.

The primary communication channel involves the use of mass-media, such as newspapers, radio and television. The secondary communication channel involves a face-to-face exchange between two or more individuals either at trade exhibitions or at planned strategy meetings.

The primary communication channel has a more important instantaneous role in the way in which it reports on a new innovation. If a problem with the innovation is quickly recognized by the media, then it could mean the end or certainly a serious set-back for its introduction. Experiences in other countries may have some influence on the introduction of a new system in the UK, especially when a long-term global view is taken. Consider the introduction of a national identity card which has been considered and reconsidered for many years, and is probably one of the most controversial subjects next to capital punishment and blood sports. The question of whether or not to make national ID cards law for the adult population in the United Kingdom is debated at every major retailing conference.

Taking a negative viewpoint, on 19 August 1994, the *Supermarketing* journal confirmed one possible view on the national ID card scheme:

'Civil liberties groups are already on the defensive and others are uneasy at the idea that big brother could use the cards to log information from medical and criminal records to financial details.....Liberty says the current proposals could be a slippery slope to a national identity smart card carrying personal details and police having the power to stop anyone at will to ask for their papers'.

Likewise, a positive report will result in the potential user taking an early interest, including technology and competitive 'critics'! Consider the positive viewpoint in *Computer Trade Weekly* on 12 August 1994:

'The Newsagents Federation has described government plans to put photographs on driving licenses as a 'step in the right direction' towards a full-blown national identity card scheme.....David Daniel, Director of federation services said 'I am convinced ID cards will come - it's just a question of when and in what form'.

#### Stage Three - The Decision.

The decision process takes time, and may be restricted to a single individual or may be considered by a representative group of individuals or company. Robin Roy suggests that there are five self explanatory stages in the decision process; *knowledge, persuasion, decision, implementation* and finally *confrontation*. It is a common experience that when the innovation decision is made by a group rather than an individual, the process is usually much more complicated!

#### Stage Four - Social, Health and Environmental Concerns.

Whether or not the decision process has been made by an organisation in authority will control the rate of adoption. Before the compulsory use of front seat belts was introduced in 1986, it was the individuals choice whether to wear one. The rate of adoption increased dramatically after the UK Government changed the law to make it compulsory.

#### Stage Five - Government Interaction and International Competition.

Perhaps specific to the chosen market sector, in the race for technology based prosperity, there is a belief within governments that better technology will result in a higher economic efficiency and therefore the international competitive edge.

By sponsoring and supporting specific technology innovations, a successful administration will attract international investment and enterprise by other nations. The French public telephone network and retail banking system is probably one of the best examples of government interaction within the card technology market. Both have adopted smart card technology as a long-term replacement to the magnetic stripe. Following a long period of neglect, by the late 1970s the network was antiquated, overloaded with the too-often occurrence of out-of-order payphones. In 1982, public pressure (market demand) resulted in the French Government agreeing to a five year programme of modernisation costing over US\$ 25 million. The interests of the Directorate General of Telecommunications in smart card technology was two-fold. As part of the modernisation programme, it was evident that the existing payphone service was inadequate, with a growing problem of vandalism. There was also a growing demand for telebanking and teleshopping facilities involving remote access to the national banking network. A growing number of French banks joined the working committee, the two larger banks being *Carte Bleue* (VISA related) and *Carte Verte* (Mastercard related).

Following some technology trials and an increase in confidence in the proposed smart card technology, the first replacement smart card operated payphones were installed during 1984, a total of about 170,000 units. By 1987, the majority of payphones had been replaced with smart card units supplied by either Landis & Gyr or Schlumberger. Vandalism fell by over 40% during the next three years, and the number of out-of-order payphones fell from 14% to 3%. Further investment and positive media response resulted in two major smart card suppliers, Honeywell Bull and Philips, being able to significantly reduce their smart card prices, resulting in the national expansion of the French smart card EFTPoS scheme. By January 1993, every bank card in France was based on smart card technology. This costly changeover is highly attributed to the pro-active policies of the French Government. Before *Carte Bancaire* was changed to smart card technology in 1989, bank card fraud was FF. 500 million. By 1993, this had fallen to FF. 42 thousand.

Let us consider non-linear innovation models, the reverse product cycle and the diffusion process in greater detail, with particular attention to the chosen product and the adopting industry - bank card technology in retail banking. In order to analyse the innovation process, the relevant organisations must first be introduced.

## 2.2 Retail Banking and Bank Card Technology - The Cast

I focus on the main groups of organisation that have some influence in deciding the future of bank cards and the technologies that will be used in the United Kingdom in future. At the present time all bank cards issued in the United Kingdom consist of a 0.030" thickness plastic card with a three track magnetic stripe, hologram and signature panel. The addition of a PIN (Personal Identification Number) and in some cases a photograph of the card holder on the card, contribute towards increasing card security at the EFTPoS or ATM. There are six alternative technologies which are being considered as a possible replacement; Contact and Contactless Smart Cards, Watermark Magnetics, Optical Cards, Holomagnetics and Xsec Security. Each of these technologies are described in detail in chapter three. I will now identify the 'cast' or main organisations who should be included in an innovation model.

### 2.2.1 The Card Manufacturers

Five bank card manufacturers (figure 2.5) produce in excess of 95% of domestic bank cards. These card manufacturers are all located in the United Kingdom.

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**Figure 2.5 Bank Card Manufacturers in the United Kingdom.**

<b>COMPANY</b>	<b>LOCATION</b>	<b>TECHNOLOGY</b>
McCorquodale Card Technology Ltd ↓	Lewes	All Bank Cards
De La Rue Card Technology Ltd ↑	Tewkesbury	All Bank Cards
Datacard Ltd	Havant	All Bank Cards
National Business Systems Ltd (NBS)	Byfleet	All Bank Cards
Thames Estuary Plastics Ltd (TEP)	London	All Bank Cards
ID Data Ltd	Corby	All Bank Cards

**Source: G Boxall, Open University**

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It should be noted that in May 1994, McCorquodale Card Technology was acquired by De La Rue Technology, with all business interests relating to bank cards being transferred to Tewkesbury, Gloucestershire. Between them, these five companies manufacture in excess of one million bank cards per week and are actively investigating new technologies, with particular emphasis on smart cards. Supporting these bank card manufacturers are the secondary manufacturers (figure 2.6) who supply core technologies. For example, although Motorola do not manufacture smart cards, they manufacture approximately 70% of the

integrated circuits used in smart cards sold within the United Kingdom. Thorn Secure Science International are the only manufacturer of watermark magnetic stripe tape worldwide, which is licensed by Malco. There are other manufacturers who contribute to the innovation process within the adopting industry (more details are provided in chapter five, figure 5.1). Figure 2.6 below represents only the front-end technology innovators.

**Figure 2.6 Secondary Bank Card Technology Suppliers in the United Kingdom.**

<b>COMPANY</b>	<b>LOCATION</b>	<b>TECHNOLOGY</b>
Thorn Secure Science International Ltd	Swindon	Watermark Magnetics
Motorola Ltd	Glasgow	ICs
Gemplus Ltd	London	ICs
US <sup>3</sup> Ltd	High Wycombe	ICs
Sligos Ltd	France	ICs
SGS Thompson Ltd	France	ICs
Schlumberger Ltd	France	ICs
OKI Semiconductor Ltd	Slough	ICs
Siemens Semiconductors Ltd	Bracknell	ICs
Hitachi Europe Ltd	Maidenhead	ICs
GEC Card Technology Ltd	Walsall	Contactless SmartCards
Control Module Inc.,	Enfield U.S.A.	Holomagnetics
West Lamination GmbH (European Office)	Hamburg, Germany	XSec Security
Drexler & Nippon Conlux Ltd	London	Optical Card
Canon Ltd	Birmingham	Optical Card
Omron Tateisi Electronics Ltd	Henfield	Optical Card

**Source:** G Boxall, Open University

There are approximately 53 million bank cards in circulation in the United Kingdom and between them, the card manufacturers produce approximately 54 million every year. Bank cards are replaced on average every 2-3 years, and approximately 2 million cards are reported lost or stolen every year. For this thesis, a selection of these bank card manufacturers were interviewed during early 1994.

## **2.2.2 The EFTPoS Terminal and ATM Manufacturers**

There are two notable items of electronic equipment which are used in retail banking. These provide the electronic interface between the consumer and retailer and the consumer and bank or building society.



### *The EFTPoS (Electronic Funds Transfer Point of Sale) Terminal*

The EFTPoS terminal provides the electronic interface between the consumer/bank card and the retailer. As described earlier in Chapter 1.3, when the bank card is 'swiped', the account data is read from the magnetic stripe and the transaction voucher printed and signed by the card holder. This data is then transmitted to the bank clearing system by a courier or telephone link. EFTPoS terminals cost anywhere in between £50 and £3,000, depending on the system specification. The personal computer is having a major impact on the designs of EFTPoS systems, with a standard IBM® PC or compatible being the central host, connected to a cash draw, LED display, barcode scanner and magnetic stripe reader. During the early 1990s, there was and continues to be a trend towards more 'open' systems which can be easily upgraded with third-party options. This thesis concentrates on one specific component, the bank card reader at each EFTPoS terminal. Having processed the bank account data, the method of sorting and transmitting it can be assumed to remain similar whichever card technology is used. Smaller retailers do not have the need for 'open server' back-office computer hardware and tend to use just one or two individual EFTPoS terminals, storing each day's transaction data on a paper-roll printout or memory card which is sent to the bank for clearing by courier or telephone link. The EFTPoS terminal manufacturing scene has seen many changes during the late 1980s to early 1990s with a large number of mergers and acquisitions. This has resulted in a relatively small number of EFTPoS terminal manufacturers having the majority market share of EFTPoS systems supplied to retailers in the United Kingdom. These include Fortronic, ICL, IBM and Riva.

### *The ATM (Automatic Teller Machine)*

The majority of the 18,000 ATMs in the United Kingdom have been supplied by three dominant market leaders - NCR, Siemens and IBM. ATMs cost around £20,000 each, excluding the cost of installation and back-office networking and in the United Kingdom, all ATMs are now on-line offering both the bank and consumer greater protection against the use of reported lost and stolen cards. Figure 2.7 lists the leading manufacturers of EFTPoS terminals and ATMs in the United Kingdom.

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**Figure 2.7 The EFTPoS Terminal and ATM Manufacturers in the United Kingdom.**

<b>COMPANY</b>	<b>COUNTRY</b>	<b>LOCATION (UK)</b>	<b>SYSTEMS SUPPLIED</b>
AT&T (previously NCR) Ltd	U.S.A.	Dundee	EFTPoS and ATM
IBM Retail Business Ltd	U.S.A.	London	EFTPoS and ATM
Siemens plc	Germany	Bracknell	EFTPoS and ATM
Retail Systems Ltd	UK	Maidenhead	EFTPoS
Olivetti	Italy	London	EFTPoS
Riva Ltd	Swedish	Uxbridge	EFTPoS
Omron Systems (UK) Ltd	Japan	Chessington	EFTPoS
Edacom Data Systems Ltd	UK	Mountfitchet	EFTPoS
GEC Avery Ltd	U.S.A.	Warley	EFTPoS
De La Rue Fortronic Ltd	UK	Dunfermline	EFTPoS
Verifone Ltd	U.S.A.	Harefield	EFTPoS

**Source: G Boxall, Open University**

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As technology suppliers to the retail and banking industry, which of these organisations, if any, have the leading role in the *technology push* side of the equilibrium? Or is the industry, without a doubt *market led*? To examine their role in the innovation process, a selection of these EFTPoS and ATM system manufacturers were interviewed during 1994, including some smaller suppliers.

### **2.2.3 The Consumer**

The consumer is perhaps the front-end market agent. In 1992, the population of the United Kingdom was 57,763,000 of whom 46% were in part-time or full-time employment. Research by BMRB (1992) confirms that the number of people holding bank cards is surprisingly low (figure 2.8).

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**Figure 2.8 Population Owning a Bank Card, Either on their Own or Jointly.**

<b>Type of Bank Card</b>	<b>% of Adults in the United Kingdom</b>
Credit or Charge Card	44.6
Store or Retailer Card	14.4
Debit Card	27.7
ATM Card	57.9
Cheque Guarantee Card	41.9

**Source: BMRB (1992).**

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BMRB's own research suggests that the ownership of bank cards is highest [over 60%] in the A,B,C1 categories, among those aged 35 to 54 years. Among the population in the C2 and D categories, just over 30% had a bank card. According to APACS (1994, p23), 78% of adults hold one or more financial cards and 1,675 million purchases were made with plastic cards in the UK alone during 1994. Card purchase volumes are forecast by APACS to increase by around 80% by the end of the century. These two sets of figures are very different. APACS has a particular responsibility to the UK banking industry. BMRB may be considered to be a more independent organisation.

The consumer certainly has some influence on future changes in bank card technology, but how much? What consumers want from their banks and what are consumer's opinions about the increasing fraud problem? Is it the bank's problem, the retailer's problem or should everyone assume greater responsibility (and cost) in trying to control the situation? Are the banks and retailers doing enough to help the consumer appreciate what is happening within the adopting industry - do they need to know anyway? A sample of consumers spread throughout the United Kingdom were sent a questionnaire during Autumn 1992 to examine spending habits, their views on new technologies and the actions of their banks or building societies (see chapter six).

#### **2.2.4 The Banks and Building Societies**

The groups of organisation which are considered within this heading are APACS, VISA International, MASTERCARD, Europay International, EMV (the collaboration between the first three), American Express and Diners Club. In chapter one, the principal idea of competition and collaboration between these organisations was introduced.

Developing this theme further, we must consider how they evaluate innovation, specifically in the introduction of a new bank card technology. Are each of these groups working closely on technology standards to introduce an internationally acceptable alternative to the magnetic stripe? Is there a dominant partner? These financial organisations can be considered both as market and technology agencies in the sense that they have market-based control over how fast a new technology is introduced, and also considerable control over what technology is successful. The eight largest banks and building societies in the United Kingdom are considered throughout my thesis. These were listed in chapter one, figure 1.1 and account for over 70% of the

UK sterling business. A series of interviews was carried out during November 1994 (see chapter 7).

### **2.2.5 The Retailers**

The retailer is also a very important market agent, perhaps with more significance than the consumer. Retailers are both small and the large, from the corner shop with just one point of sale terminal and annual sales of typically £200,000, or the supermarket with 20-30 point of sale terminals, a back-office processing system and annual sales of typically £30,000,000.. A contrast can be made between technological advances that improve conventional retailing operations and those that transform the way in which consumers shop. Regarding technological advances that improve retailing operations, Ronald Brown of *Post News* suggests what retailers require.

'...fewer errors in entering sales information.....faster transactions.....easier and quicker staff training.....the ability to link to a credit or debit card terminal giving instant on-line authorisation.....better information for management.....ability to link to electronic data interchange systems so that suppliers can be kept informed of sales on an hour-by-hour and day-by-day basis.....and all of course as cheaply as possible' Brown (1993, p21).

Do retailers have much influence on the decision to introduce a new bank card technology? Do retailers want more influence in this respect? Following the 'failure' of the EFTPOS'UK organisation, are retailers more astute to what is happening in retail banking and are they working closer together, through the Retail Consortium ? We examine the views of both small and large retailers at store and head office level (see chapter 8).

## 2.2.6 The Media

*'MASTERCARDS will all be smart cards by the year 2000'*  
Computergram International, August 1994

*'Debit cards take off'*  
Banking World, September 1991

*'What's wrong with cash machines'*  
Which? Consumers Association, February 1991

*'Retailers act on card charges'*  
Daily Telegraph, March 1992

*'Shops pick the cashless card'*  
Swindon Evening Advertiser, October 1994

*'Technology against fraud.....the hi-tech battle'*  
Card Watch, July 1993

The media clearly has something to say about the activities of the banks, retailers and technology suppliers. Media can be used either to promote a new product or process or can publicly oppose the innovation.

In the retail banking industry, we can identify the key media as the following organisations. A more detailed list is provided in Chapter 9.

1. National Daily newspapers
2. Local Daily or Weekly newspapers
3. Prominent Trade Publications
4. Consumer Publications
5. Trade Exhibitions & Trade Associations
6. Radio & Television

It can be argued that larger organisations with substantial marketing budgets will have more successful promotion than smaller entrepreneurial individuals with limited capital investment. This may well be true, but how much involvement does the media have in helping a product or process succeed [in retail banking] and is the media particularly bias towards particular organisations?

### **2.2.7 The Government**

A prominent speaker at the RMDP Retail Banking Conference in 1994 began his presentation by saying

'Government Ministers are only in office for two years - they tend to make short term decisions in their own interests! Ministers do not want to be seen as being in conflict with one another'.

Banking and the technologies adopted have both national and international standards to follow, for example, the Data Protection Act 1984, the Consumer Credit Act 1974 or the Building Societies Act 1988. There is also the Monopolies & Mergers Commission. These acts were all agreed within central government to limit data storage of private individuals, protect the consumer and extend the range of services offered by building societies. Assuming that a new bank card technology is proposed for medium-term national adoption, what influence should central government have, if any?

### **2.2.8 Positive and Negative Experiences in Other Countries**

In Germany, bank cards used in ATMs use a security feature called the MM-sensor based on magnetic stripe technology. This security device is currently unique to Germany. In Sweden, bank cards use Watermark technology on track two, the only country in the EU to do so. In France, bank cards initially adopted Bull CP8 Smart Card technology, later changing to middle position ISO7816 in the early 1990s as this was confirmed as being the long-term international standard.

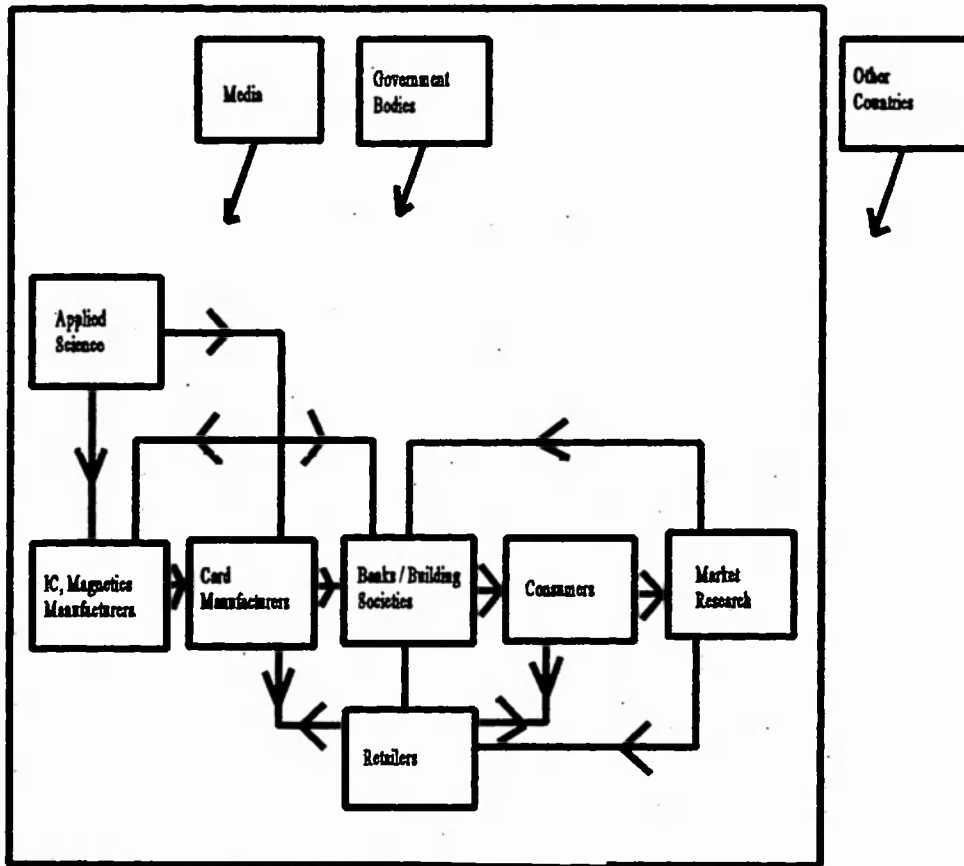
During 1992-1995, there were substantial trials of smart cards taking place in Belgium, Denmark, Finland, Portugal, Singapore, South Africa, Spain, Switzerland, Taiwan and the USA. All of these trials, and their outcome, will influence the direction and speed of bank card technology changes in the United Kingdom - but by how much? There are also an increasing number of electronic purse scheme trials taking place throughout the EU. The majority of these trials are reviewed by the critics as being closed systems on a country basis.

### **2.3 The Non-Linear Innovation**

To summarize, innovation within retail banking should not be considered as a linear process, but one with a complex structure of feedback loops incorporating many important influential organisations. There is a diverse set of actors involved, all interacting with each other. Developed on the ideas promoted by Kline (1989) and Barras (1989), figure 2.9 illustrates a non-linear model without placing a stronger or weaker emphasis on any one particular group. The loops represent the most important relationships.

This model, developed from the literature surveyed in chapter one and an understanding of the non-linear process of innovation discussed in this chapter will be referred to later in the thesis. I will focus on the individual groups as well as how they interact.

**Figure 2.9 The Innovation Process, Identifying the Key Feedback Loops in the Adoption of a New Bank Card Technology.**



**Source: G Boxall, Open University**



## Chapter 3

### Bank Card Technology - The Options

The purpose of this chapter is to describe the range of technologies currently being considered as a replacement for existing bank card technology. Focusing on the technical and commercial merits, each is discussed, first as a concept, then interfaced into the retail banking application. Important requirements include the data capacity of the card technology offered and the protection against fraudulent use or copying. Until recently, data storage with existing magnetic stripe technology has never been considered to be a limiting factor. As more secondary applications for bank cards are identified, for example the electronic purse and customer loyalty schemes, the data capacity of future technologies becomes an issue. At the same time, security becomes a concern as the investment into new technology must show longer term payback in terms of protecting banks and retailers, and ultimately the consumer against bank card fraud.

#### 3.1 Bank Card Technology - Technical Standards Today

Before considering alternative technologies, existing bank card fabrication should be appreciated. A bank card is manufactured using four layers of plastic, figure 3.1, two of which, are printed with the front and rear design and two of which are used as a front and back laminate. A magnetic stripe, hologram and a signature panel are all attached to the card, before a laminating press is used to heat seal the 'sandwich' into a 0.76mm (0.030") plastic card. Four independent security features are manufactured into existing bank cards - the signature panel, magnetic stripe, hologram and fluorescent security ink.

##### *The Signature Panel*

Being a security feature, the signature panel is designed so that the true card holders signature cannot be erased without damaging the base material. Any attempt to chemically remove a signature with water or solvent is made obvious by the release of dyes, making it almost impossible to erase a signature without evidence. This security feature does not however stop an alternative signature being written onto the card, if it is intercepted before reaching the valid card holder at the time of issue. There have been occasions in which a new signature panel has been temporarily attached over the original, and used fraudulently. Simple labels are used to cover the genuine signature panel and the forged

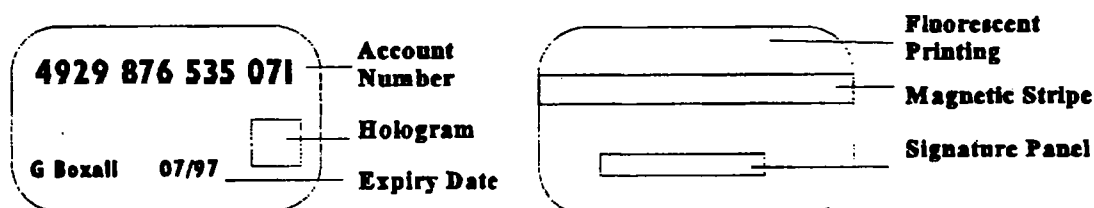
signature is written. One of the major criticisms of this form of security is the speed at which checkout staff have to check the card and voucher signature. Many critics claim that a subjective view made within 2-3 seconds is not adequate. Since 1991 following a more serious fraud problem, retailers are being educated by the banking industry to be more careful in checking all bank cards presented.

### *The Magnetic Stripe*

The magnetic stripe is the main component. Both the data capacity and security problems are considered. The card issuers introduced a magnetic stripe on bank cards in 1969, a piece of 0.5" magnetic recording tape, permanently attached to the card during the manufacturing process. The banking organisations agreed the design requirements - now ISO 7811 Parts 4 and 5 and the encoding requirements. The card holders account number and bank sort code are encoded on the magnetic stripe and embossed on the front of the card. A primary account number (or PAN) can consist of up to 19 digits and the Issuers Identification Number (or IIN) is 4 digits - Figure 3.2.

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**Figure 3.1 Existing Bank Card Security Features**



**Source: G Boxall, Open University**

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The bank account number and sort code follows the Issuers Identification Number. The last digit of the PAN is a check digit. It will detect any single digit error as the data is decoded at the EFTPoS or ATM; according to Clough (1994) 'it will detect 98% of errors caused by two adjacent numbers being accidentally transposed, and 90% of random entry errors'. This is an important security feature, checking that the none of the individual numbers have been modified or tampered with, or when card numbers are manually keyed into a EFTPoS terminal.

**Figure 3.2 The Primary Account Number Embossed on a Bank Card and Encoded on Track Two of the Magnetic Stripe**

Card Type	Number of Digits in Account Number	First Digit
VISA	13 or 16	4
MASTERCARD	16	5
American Express	15	3
Debit Cards	Varies between issuers, up to 19 digits	Varies
ATM Cards	Varies between issuers, up to 19 digits	Varies

Name of Bank	Type of Card	IIN
Barclays Bank plc	VISA	4929
Midland Bank plc	VISA	4546
CO-Operative plc	VISA	4550
American Express	AMEX	3746
Midland Bank plc	MASTERCARD	5434

**Source: RMDP (1993)**

The security of the magnetic stripe is enhanced by the use of a PIN (Personal Identification Number) which is designed to be only known by the account holder. In principle, a PIN can provide a 100% secure system. In reality this is not the case, with PINs being written on a piece of paper and kept with the card, and friends and family members being informed of the PIN to withdraw cash on behalf of the card holder. Data on a magnetic stripe can also be copied from the original bank card to a non-banking plastic card of a similar specification and used in an ATM if the PIN is known by a potential fraudster.

Two devices are used in retail banking to interface with the magnetic stripe bank card. The swipe reader to read track two at the EFTPoS (typical cost £20) and the motorised reader/writer within the ATM (typical cost £400). If a new technology is adopted, it should in theory at least, match these overheads or if costing more, offer some extra benefits to the industry. The different types of bank card fraud were considered in Chapter one. It is important to appreciate how serious the problem could become, should the UK banking system become compromised more than it has been to date. According to VISA International, their own network of ATMs consists of 15,000 in the UK alone with over

234,000 worldwide. VISA have over 392 millions bank cards in circulation worldwide and are processing more than 1,400 retail transactions per second - the potential losses resulting from bank card fraud causes concern to the retail banking industry in the short term. Various additional technologies have been suggested for enhancing the security of a magnetic stripe, including Watermark magnetics, Xsec and Holomagnetics.

How about data capacity? The magnetic stripe contains three parallel tracks numbered in relation to the top each of the card, downwards as tracks one, two and three. Track one is encoded with up to 76 alphanumeric characters and contains details of the card holders name and initials. Track two is encoded with up to 40 numeric characters, including the account number and sort code of the account holders bank. Track three was introduced sometime after the other tracks and can be encoded with up to 107 numeric characters. It is the only 'read and write' track for financial transaction cards and contains details of ATM transactions (amount last withdrawn, time, date and location of the ATM. Therefore, the total data capacity of the magnetic stripe according to the ISO7811 standard is 223 characters. When bank cards were first introduced, this was more than adequate. With the service industry 'explosion', the service providers recognise the potential for adopting a new card technology such as smart card or optical card for storing and processing much greater quantities of data.

#### *The Hologram*

Holograms are a visual security feature built into the structure of all bank cards. Holograms were introduced by VISA and MASTERCARD initially for credit cards in 1984, with the main objective of making counterfeiting more difficult. Consisting of a three-dimensional image on the front and usually the back of a bank card, holograms for the retail banking application were developed in Essex by Applied Holographics Ltd. Holograms are manufactured using three images implanted at three different levels on the card. The image and its colour change as the viewing angle is changed, and is considered a very good safeguard against mass produced forgeries since expensive, specially programmed laser equipment is needed to make the three images. One problem highlighted during my research is the increasing number of bank card hologram manufacturers evolving in the Far East, with some of the more dubious companies supplying a ready-made market in counterfeit fraud. Holograms can only prove that a bank card is not fake - it does not confirm that the person presenting the card is the true card holder.

Fluorescent printing is a non-visual security feature which is designed to help prevent photographic copying of bank cards. The printed image on the front and back of a bank card incorporates special colour printing inks that will 'confuse' a colour separation camera used in the preparation of forgery artwork. Although these inks are not visible to the eye, defined patterns and logos become visible when the card is held under a ultraviolet light source.

Of the existing security features, the magnetic stripe is of the greatest interest in the context of this thesis, and probably the greatest at risk of being compromised in the short term. The magnetic stripe contains the data required to permit a financial transaction between the consumer and retailer or bank, and with card encoding hardware being readily available, 'Skimming' is the problem that the retail banking industry has to address. What alternative technologies are available?

### **3.2 Alternative Bank Card Technology**

What is required? The retail banking industry is asking for a very secure data storage and verification system, together with the option to store more data if required at a later date. Cost is an issue, given the time and effort needed to update or replace existing EFTPoS and banking hardware. Six different technologies are considered, in terms of the security benefits and data capacity benefits they can offer the retail banking industry. A seventh additional feature, biometric security, is also considered as a potential security enhancement.

#### **3.2.1 Watermark Magnetics**

Swedish banks utilise a sophisticated type of magnetic encoding known as Watermark encoding. Thorn Secure Science International Ltd (TSSI) in Swindon, England developed and patented the process during the early 1970s. A watermark magnetic stripe, at first sight, looks like any other magnetic stripe found on a plastic card. A detailed examination reveals an organised structure in the metal oxide layer. This is formed at the manufacturing stage, at the time when the card base is coated with the magnetic oxide slurry that later forms the magnetic stripe. Small needle shaped particles of gamma ferric oxide which are orientated in either the horizontal direction or turned through 90° or 45° are

deposited along the length of the magnetic stripe in a coded pattern. The solvents are then driven off, leaving the coded pattern in a permanent state. The bar pattern is controlled so that after every 85mm (one card width) a completely new pattern is generated on the tape. Each new pattern is unique. Data is encrypted using a secure algorithm linking it to the unique watermark magnetic number which has been agreed with the end-customer (issuing bank). Because of the high security applications in which watermark magnetics is used, every precaution is taken by TSSI to ensure that no watermark numbers are duplicated.

Since the production of watermark tape began in 1976, Thorn Secure Science International estimate that 400 million cards have been supplied with the current annual production exceeding 100 million cards.

In terms of security, the evidence from trials carried out by VISA and past experience in other applications, suggests that it is impossible to copy a watermark encoded magnetic stripe, and this technology has been considered as one possible solution for the adopting industry. Watermark magnetics however, does not offer greater data capacity beyond the standard 223 characters, and this, the industry recognises as a limitation. Other than security there are few other benefits.

### **3.2.2 XSec Security**

XSec uses existing magnetic stripe technology, enhancing the security of data stored on the magnetic stripe. The card reading and writing hardware is not replaced, but upgraded with new electronics. Developed in 1991 by Dr Denise Jeffreys of the 'X-Tec Corporation' in Miami, U.S.A., it is marketed in Europe by 'West Lamination GmbH' in Hamburg, Germany. XSec has two distinct elements. Firstly, it offers a direct means of virtually eliminating magnetic stripe card counterfeiting. Secondly, it allows information stored on a card to be retrieved if the magnetic stripe is scratched or otherwise physically damaged. Card Technology Today (1994) believe that it definitely has some potential.

'A newly launched approach to magnetic stripe security has the potential to revolutionise the magnetic stripe card industry and may have a seriously detrimental effect upon the smart card marketplace.....Will it be a success? We think so!'

Jeffreys (1993) explains that the security system is based on the premise that it is always easier to measure a physical quantity than to measure and reproduce the same quantity. As the number of measurements taken from the original increase, so it becomes even more difficult to produce a copy. In the case of magnetic stripe encoding, the difference between the relative read and write accuracy is quite large. The principal reasons for this, is in the errors in the exact placement of the data transitions (binary '0's and '1's) or 'Jitter' as it is known technically. XSec uses multiple samples of the relative jitter to produce a 'key' that uniquely identifies a magnetic stripe card. This key is encrypted many times and rewritten back to the card when it is used or used in an ATM. If the card data is copied, the key will be copied across, although the original jitter pattern will have changed on the duplicate card. This makes the process effective at detecting counterfeit bank cards produced by copying or skimming on conventional equipment. The upgrade electronics consists of a single IC which is added to the EFTPoS and ATM system hardware, costing around £50 excluding labour costs etc.,

There is one considerable disadvantage for XSec. It is a relatively new innovation, has had very limited field trials in the U.S.A. only, and the market does not have enough experience to identify potential long-term problems. XSec also offers no advantages in relation to data capacity - being limited to the standard 223 characters. It is worth noting that XSec was publicly sidelined in 1993 by both VISA and MASTERCARD who claimed that it wasn't ready for the market-place.

### 3.2.3 Holomagnetics

Holomagnetics was introduced by 'Control Module Inc.', in Enfield, U.S.A. in 1990 and is marketed in the United Kingdom by Kurz Ltd in Watford, Hertfordshire. A holomagnetic stripe is applied to the plastic card at the manufacturing stage in place of the standard magnetic tape. The holomagnetic stripe consists of a magnetic tape with a pseudo random optical pattern which is visible on the surface of the tape - no two patterns on a single card are identical, or as confirmed by Control Module Inc., only 1 in 50 million cards will have the same pattern. As the card passes through the reader, the unique pattern is read by four optical detectors to reproduce the Card Identification Number (CIN) consisting of 35 bits. This number is encrypted and encoded on the magnetic stripe. Every time the card is used, a comparison is made between the encoded CIN on the magnetic stripe and the original CIN reproduced by the unique pattern. If the card is copied, these numbers will not match.

Similar to XSec, there is one considerable disadvantage for holomagnetism - it is a relatively new innovation, and has only been used in a handful of access control applications in the United Kingdom. In April 1993, Kurz explained to me that 'we are actively and successfully promoting the technology [holomagnetism] and can confirm that VISA are very interested in it'. In relation to existing bank card technology, the card costs increase by approximately 5% and the extra cost to upgrade EFTPoS terminals and ATMs is about £90. Similarly to watermark magnetism and XSec, holomagnetism offers no advantages in data capacity, being limited to the standard 223 characters

### 3.2.4 Optical Cards

In comparison to magnetic stripe and watermark magnetism, optical card technology is a comparative newcomer, although the basic concept it employs was developed during the 1930s. The optical card was introduced by Jerome Drexler in 1981 who founded the 'Drexler Technology Corporation' in the U.S.A. Drexler are represented by their subsidiary in the United Kingdom, 'LaserCard Systems Corporation Ltd'. Whilst Drexler hold the majority of patents, there are a selection of other companies who have patents of their own and are actively pursuing a large variety of applications - Conulux Inc, U.S.A., Omron Tateisi Electronics Inc., Canon Corporation Inc., and Olympus Optical all from Japan.

The optical card is the same size and thickness as a standard credit card and consists of a 'sandwich' comprising two outer layers of protective plastic within which is a layer of suspended silver particles backed with a non-reflective layer. During the writing process, a laser is used to burn a pattern of  $5\mu\text{M}$  diameter pits in the silver film. By switching the laser on and off during the writing process, a string of binary '1's and '0's can be encoded on the card. A typical optical card can store 5 Megabytes of data, the equivalent of 1,000 A4 pages of text or perhaps 60-80 graphic images on a card the same size as a bank card today. During the reading process, a lower power laser is used to identify the pits which provide a non-reflective surface in comparison to the unburnt areas, resulting in a sequence of '1's and '0's which correspond to the original ASCII data or halftone image. There are two standards, the DELA standard and the Canon standard with very few differences. The DELA standard appears to be the most dominant in today's market. It is suggested that



Canon introduced a new standard to enhance competition between the various suppliers. In 1989, the small number of companies promoting the technology estimated that the industry would grow to about £8 billion by 1995. By 1993 estimates were considerably below this figure and speculation about where this business would evolve. Current uses focus on healthcare and automobile service warranty cards. Although retail banking is not regarded as being high on the agenda, it is still considered as a suitable application for this technology.

One factor prohibiting advancement of this technology is the cost of reading and writing hardware - typically £1,300 per system. Optical cards cost approximately £5 each. In the United Kingdom, optical cards have only been used for small 'closed' systems and have still to be proved suitable for a national 'open' applications. The only substantial financial based applications are taking place in the Eastern European countries and perhaps surprisingly in a former Soviet Bloc country as reported by Card Technology Today.

Drexler Technology Corporation has an order for another 100 electronic money card payment systems to add to the 15 systems ordered at the end of last year for installation in an as yet unnamed former Soviet bloc country. The new order is worth US\$500,000 for the system alone; Jerry Drexler, President of Drexler Technology told CTT that he was expecting to secure an order for a minimum of 100,000 cards to accompany these systems.....' (1/1994, p3).

### **3.2.5 Contact Smart Cards**

The smart card industry was first developed twenty years ago in France and is widely accredited to Roland Moreno, a French journalist who conceived the idea of embedding a programmable integrated circuit (IC) within the size and thickness of a standard bank card. Moreno registered the first patent describing the smart card as 'a card with self protected integrated memory' on behalf of his company 'Innovatron', formed in 1974.

The term smart card is often used to describe a card that contains a data processor and storage or memory device, as opposed to a memory only card. The main difference with other card technologies is that the card is 'smart' in performing its own internal processing. The ISO 7816 standard describes a smart card as an ICC, Integrated Circuit Card. Externally, the smart card consists of a plastic carrier, the IC and the surface mounted contacts which are used electronically to transfer data. It is important to distinguish

between a memory only card and a processor smart card which has internal processing capabilities. Internally a smart card usually includes the following components: a data processor and RAM memory using currently available semi-conductor technologies, wired logic implementing specific processing algorithms, a clock and a communications interface. The ROM memory contains the operating system instructions. See Figure 3.3.

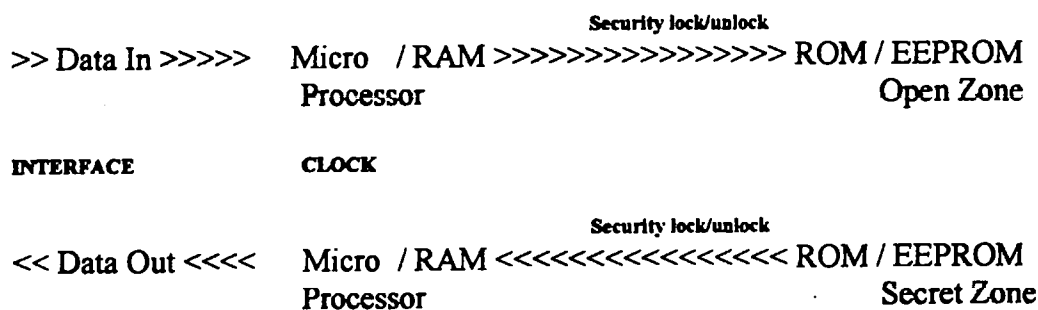
The insertion of the IC is a delicate operation and usually occurs at the end of the card manufacturing process to reduce the exposure to potential damage. Each chip conforms to the ISO specification (ISO 7816 Parts 1 to 4) and can be no thicker than 0.6mm. During the 1980s many techniques for inserting the IC into the plastic base were considered. The simplest and favoured process is to mill out a circular cavity in the plastic card, inject some adhesive and insert the IC with moderate pressure. To reduce the possibility of the chip popping-out of its glued recess during use, Tape Automated Bonding (TAP) is used for large scale production.

**Figure 3.3 The Architecture of a typical Processor Smart Card.**

The smart card externally:

		Pin	Signal
□1	□2	1	Voltage Supply
□3	□4	2	Ground
□5	□6	3	Reset Signal
□7	□8	4	Programming Voltage
		5	Clocking Signal
		6	Data In / Out
		7	Not Used
		8	Not Used

The smart card internally:



Source: G Boxall, Open University

Data capacity is an important benefit. The active memory inside a smart card varies between manufacturers, but is typically between 128K bits (typically £0-70) to 32K Bytes (typically £12), with a general rule that the larger the memory, the higher the cost, as shown in parenthesis. Remember that existing bank card magnetic stripe technology can store approximately 223 characters (or bytes) of data if the ISO standard is followed for encoding data. Data capacity can be selected to match the application, and thus smart cards have a great advantage over many of the competing technologies.

Protection against fraudulent use is perceived by some as another benefit. The options for using smart card technology can be considered. By carefully designing a card's operating system, a wide range of permutations of memory allocation can be created to protect the cards contents and the card holders privacy. There may be, for example, three different areas of memory. There may be 'free zone' where all data is available by using any suitable card-reading device, and may include the account holders name and account number; a 'locked zone' for which a password is required before access to any data is granted. This may include data relating to past transactions; and a third area of memory (the 'control zone'). Data stored here is never communicated externally but can only be read by the cards logic circuit. It may contain the card issuers confidential code, the algorithmic keys for data encryption and decryption and the card holders own password or PIN. Hence, the inherent security of a processor smart card is excellent. There is evidence from the French banking system to support this, although the cost is still prohibitive.

Smart cards are used in many applications worldwide. In the United Kingdom, they include Telephones, GSM Mobile Telephones, Sky Television, Health and Insurance Identification Cards and Electronic Purse or Vending Schemes. Card reader/writer costs are considerably lower (typically £80) than for magnetic stripe cards, although the card cost is considerably higher (typically £3), this being the main constraint for the potential use of smart cards in retail banking (reviewed in chapter 3.3).

### **3.2.6 Contactless Smart Cards**

**Richard Poynder, Chairman of the Smart Card Club suggests that**

**'if contactless smart cards had been invented first then would the contact variety have ever got off the drawing board?....As it is, their late entry into the marketplace has meant delays in producing satisfactory standards and a massive population of contact cards in most application areas'**

**(Personal communication, 1995).**

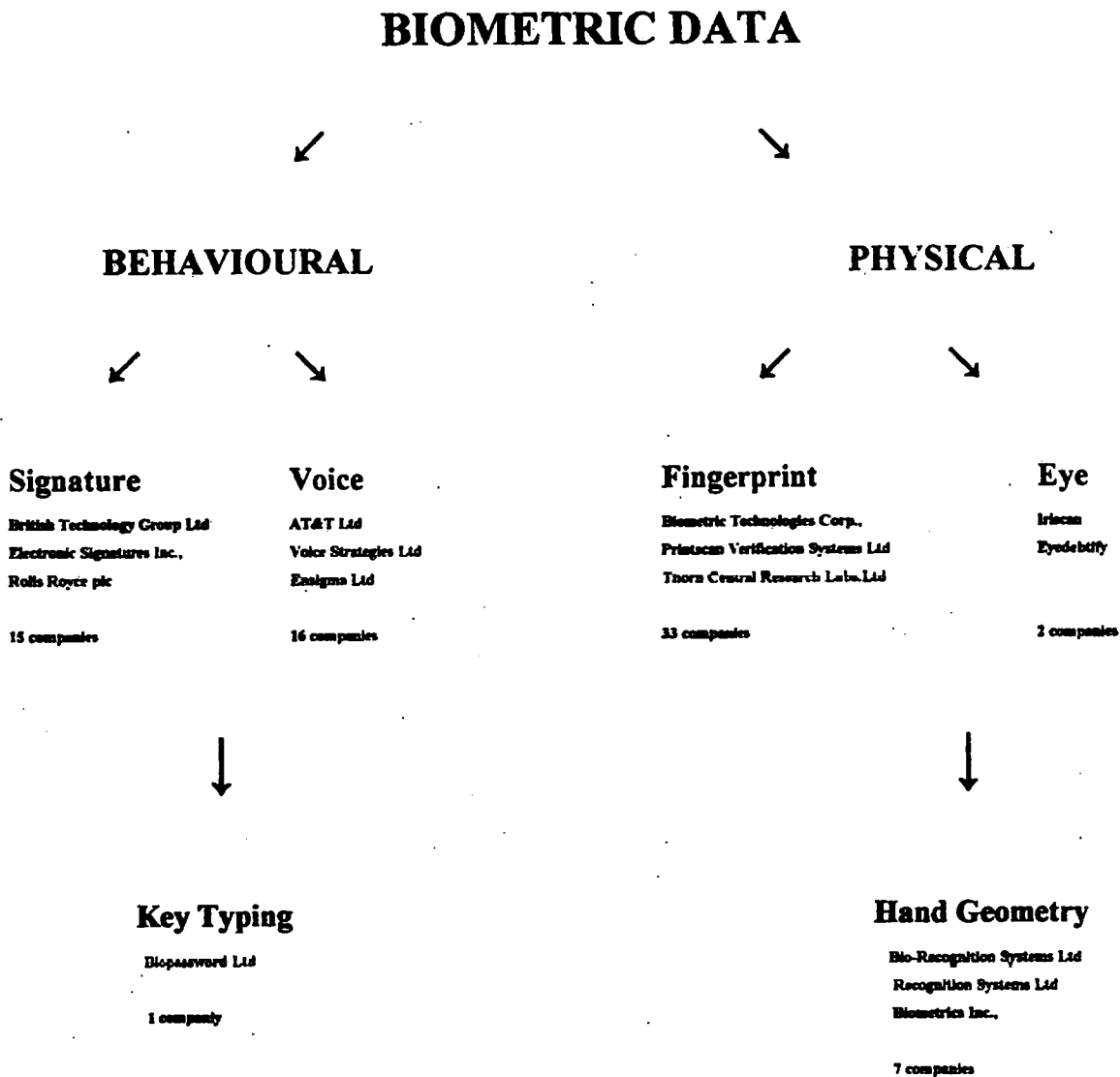
**Contactless smart cards function in a similar way to the contact version and from the outside look identical to an existing bank card, except that the data transfer with the outside world is via a radio link at a relatively short distance - typically 200mm - 10M between the card and reader. The operating frequency varies between the long wave (150kHz), medium wave, microwave and infra-red. The international standard is ISO 10536 of which there are three parts: The physical characteristics; dimension and location of coupling areas; and, the electronic signals required by the card. In hostile, dirty or chemical environments, contactless smart cards are more reliable than the contact. They are less reliable in environments with high electrical noise. Most contactless smart cards are battery powered, offering key advantages such as higher data transfer speeds, longer range and a longer product life. Against this is the disadvantage of higher production cost, typically £7.00 to £14.00 for small quantities, depending on the size of memory. Contactless smart cards either require a low power battery or inductance loop to provide power. It is generally recognised that the contactless smart card was never invented for the retail banking industry, being more suitable for proximity access control, identification and ticketing applications.**

### **3.2.7 Biometric Security**

**Whilst PINs are transferable from one person to another, a biometric identification identifies a person and is based on either a unique behavioural or physical characteristic. Figure 3.4 illustrates the different forms of biometric technology available, together with the leading suppliers in June 1993. Biometrics usually work by comparing the presented identity with a template (typically 1,000 bytes), stored either on a database, smart card or optical card. Of the available biometrics, the market tends to favour fingerprint or signature technology. Market researchers (reporting in many trade related publications) suggest that these two are socially acceptable, although the handicapped, young and elderly are more likely to experience problems at the EFTPoS.**

There is no doubt that biometrics has a future - consider the number of companies actively developing systems for commercial application. It should be noted that many of the organisations contacted about this subject consider that biometrics will not be commonplace for at least five years and will be added onto whichever card technology is selected.

**Figure 3.4 Biometric Security - The Different Options and a Selection of Suppliers.**



**Source: Newman (1995)**

### **3.3 The Economics**

The investment required to update bank card technology is significant. At minimum, there is the cost of producing 54 million new bank cards and upgrading or replacing existing card reading and writing hardware for 250,000 EFTPoS terminals and 20,000 ATMs in the United Kingdom alone.

There are thus two areas of importance. The cost of replacing all of the bank cards in the UK and the cost of upgrading or replacing the ATMs and retailer's EFTPoS terminals.

#### **3.3.1 Bank Card Economics**

Market needs can, in reality be met by any one of the technologies described above. Card economics should consider all aspects of card production and issuing, such as the cost of manufacturing and personalisation, card security, visual attractiveness, ruggedness and the resistance to electrical, magnetic and physical damage. Figure 3.5 considers each technology in relation for each of these factors.

There is one definite advantage for the magnetic stripe bank card - it already exists and has been successfully on 'trial' for almost twenty five years. The main concern regarding this technology as it is currently used, is its' poor protection against fraudulent use. There is a certain degree of technology push as the alternative technologies are promoted to the market. Overall, watermark magnetics or smart card technology seem the most promising innovations.

Magnetic stripe cards, without a doubt, offer a high level of reliability. Although bank cards are re-issued every 2-3 years, independent tests by Omron Electronics have shown the life of a magnetic stripe card to exceed 50,000 insertions through an ATM or EFTPoS terminal. The 2-3 life cycle is a necessary control by the banks and building societies to help reduce fraud and monitor card use. Bank cards currently offer good resistance to electrostatic damage, but poor resistance to magnetic damage. Whilst there has been some complaints from consumers suggesting that their bank cards are unreadable at the EFTPoS or ATM, these are relatively rare. In a test carried out nationally by VISA in 1992, 98% of bank cards were successfully read at the EFTPoS. What of the alternatives? Optical cards have for a long time been a distant contender.

**Figure 3.5 Bank Card Economics Using Different Technologies.**

	Card Cost (1)	Security (2)	Card Cost / 5 Yrs (3)	Durability
Magnetic Stripe Card	£0.50	Poor	£1.00	Good
Watermark Magnetics	£0.60	Average	£1.10	Good
Optical Cards	£5.00	Good	£11.00	Poor
Contact Smart Card	£3.00	Good	£ 8.00	Average
Contactless Smart Card	£7.00	Average	£15.50	Good
XSec Security	£0.50	Average	£ not available	Good
Holomagnetics	£0.60	Average	£ not available	Average

	Resistance to Electrical Damage	Resistance to Magnetic Damage	Resistance to Physical Damage
Magnetic Stripe Card	Good	Poor	Good
Watermark Magnetics	Good	Poor	Good
Optical Cards	Good	Good	Poor
Contact Smart Card	Poor	Good	Average
Contactless Smart Card	Poor	Good	Good
XSec Security	Good	Poor	Good
Holomagnetics	Good	Poor	Average

	Maturity in Banking (4)	Maturity / Other Applications	Data Capacity
Magnetic Stripe Card	Good	Good	1,500 bits
Watermark Magnetics	Medium	Good	1,500 bits
Optical Cards	Low	Medium	4MBytes
Contact Smart Card	Medium	Good	8KBytes
Contactless Smart Card	Low	Medium	8KBytes
XSec Security	None	Low	1,500 bits
Holomagnetics	None	Low	1,500 bits

(1) Standard 0.76mm thickness card, printed and personalised. (2) Security considers two aspects; ease of producing a duplicate counterfeit and the ease of obtaining personal account data of the card. (3) Based on replacing a card every three years and allowing for 4% being lost or stolen, cost of fraud is NOT considered in these figures. (4) Worldwide.

**Source: G Boxall, Open University**

The application of the technology is too new, and the cost of the cards a limiting factor. Is a 4MByte data capacity really needed for this application? XSec and Holomagnetics are recent innovations, being regarded as too novel and untested for retail banking. Whilst Kurz are working to achieve success in this sector, they have confirmed that access control is currently the most interesting application for holomagnetics. There are social concerns regarding the use of contactless smart card technology, and the 'contactless' aspect

is not considered as a benefit, this technology being used mainly in ticketing (annual season cards) and access control. Thus, contact smart cards and Watermark Magnetics are the most promising contenders for the future with VISA, Mastercard and Europay evaluating both for eventual adoption. The capital cost of introducing smart card manufacturing plant is estimated at between £500,000 and £750,000. For existing bank card manufacturers hoping to obtain a share of the smart card industry, investment on this scale does not appear to pose a problem.

### **3.3.2 EFTPoS Terminal and ATM Economics**

Hardware Economics should consider the cost of replacing or upgrading the existing card readers in existing EFTPoS terminals and ATM. It should also consider the cost of new training for technical staff and the hidden cost of losing customers to the competition if 'teething' problems relating to the technology in its early days persist. Figure 3.6 considers each technology and accounts for the cost of upgrading the card reader only.

#### *Upgrading the EFTPoS Terminal*

Most EFTPoS systems have the bank card reader (swipe reader) electronically connected to the host computer system via either a keyboard wedge or RS232 interface. Data is received as a stream of serial ASCII characters - similar to keyboard input. In principle, this allows it to be easily replaced with a new reader designed to operate with any of the card based technologies listed in Figure 3.9, assuming the output is similar. The upgrade costs suggested do not include changes to the system firmware or software, since it is particularly difficult to estimate costs. Costs depend on the system configuration within each retail store or bank. Estimates suggest however, that these costs would increase in the following order; Watermark Magnetics (lowest firmware/software upgrade cost), XSec Security, Contact Smart Cards, Contactless Smart Cards, Holomagnetics and Optical Cards (highest firmware/software upgrade cost). Smart cards could prove to be more costly, depending on the data stored on each card and how much of this data has to be handled by the EFTPoS terminal or ATM.



**Figure 3.6 EFTPoS Terminal and ATM Economics Using Different Technologies.**

	<b>Cost of EFTPoS Terminal Upgrade (1)</b>	<b>Ease of Upgrade (2)</b>	<b>Annual Service Cost (3)</b>
Magnetic Stripe Card	£ n/a	£ n/a	£ 50.00
Watermark Magnetics	£ 50.00	Middle	£ 60.00
Optical Cards	£ 600.00	V.Difficult	£ 300.00
Contact Smart Card	£ 100.00	Easy	£ 50.00
Contactless Smart Card	£ 100.00	Difficult	£ 100.00
XSec Security	£ 50.00	Middle	£ 50.00
Holomagnetics	£ 150.00	Difficult	£ 100.00

	<b>Cost of ATM Upgrade (1)</b>	<b>Ease of Upgrade (2)</b>	<b>Annual Service Cost (3)</b>
Magnetic Stripe Card	£ n/a	£ n/a	£ 200.00
Watermark Magnetics	£ 75.00	Middle	£ 300.00
Optical Cards	£ 1300.00	V.Difficult	£ 600.00
Contact Smart Card	£ 1000.00	Easy	£ 300.00
Contactless Smart Card	£ 1000.00	Easy	£ 300.00
XSec Security	£ 250.00	Middle	£ 200.00
Holomagnetics	£ 150.00	Middle	£ 200.00

(1) Costs suggested only include the card reader and not propriety software or firmware, based on average prices supplied by leading manufacturers: Omron, Neuron, Sankyo, Panasonic, American Magnetics, Magtek, Control Module, XSec and Conulux. (2) Ease of upgrade suggest how straight-forward the changeover may be, in terms of changing the card reader only. (3) Card Reader servicing only as it is assumed that the other hardware (paper money issuer) remains unchanged.

**Source: G Boxall, Open University**

Thorn Secure Science International suggest that 'a two year period would be needed to upgrade every EFTPoS terminal to accept watermark magnetics in the United Kingdom' and would therefore probably be introduced on a regional basis. In Touch (1994), journal made a prediction that

'MASTERCARD is to introduce smart card technology for all its branded payment cards by the year 2000 with terminals being capable of accepting both [existing] magnetic stripe and IC cards likely to appear in high street stores from 1996 onwards'.

It is clearly evident that any change in bank card technology will take time and therefore the consumer must expect a period during which two technologies are available, with potential to confuse checkout staff and consumers. Eventually the magnetic stripe would be phased out, or would it? We still have to pay for goods and services in other countries!

### *Upgrading the ATM*

ATMs contain a motorised magnetic card reader/writer with a shutter mounted on the front. The unit is motorised, so that in this unattended situation, bank cards can be retained or 'swallowed' by the ATM and kept by the bank or building society. It is able to write back to track three any data relating to the off-line credit limit, limiting the card holder to a pre-specified value of transactions during a period of time, ie. a limit of £500 withdrawal in any 24 hour period. The shutter is required to reject foreign objects and coins being accidentally or intentionally forced into the ATMs mechanism.

As for the EFTPOS terminals, the upgrade costs suggested in figure 3.9 do not include any changes to the system firmware or software for which it is particularly difficult to provide a finite cost. It should be noted however that many of the motorised card read/write units manufactured since about 1990 allow for a contact smart card or watermark magnetics upgrade. Sligos Payment Services suggest that a budget of £25 million should be allocated for upgrading the nation's ATMs. The three major ATM manufacturers (AT&T, IBM and Siemens) have had upgrade kits available for their ATMs to accept contact smart cards since about 1989. Research and development by these companies has also studied the possibilities for upgrading to watermark magnetics, XSec or holomagnetics, but contactless smart card and optical cards have received limited attention.

### **3.4 Bank Card Security Vs. Data Capacity**

Which of these technologies offers the best compromise in terms of cost for the benefits provided to the industry as a whole? Smart cards seem to provide a suitable alternative for most although at a considerably higher cost to the industry. Most of the other technologies are either too novel or have a limited data capacity.

Smart cards have been in use for over twenty five years and although there is only limited experience in the retail banking sector (worldwide), they are used in many other applications. Mooney (1995) suggests that

**'Smart card technology and telecommunications facilitates incremental growth of on-line commerce with capability to deliver secure pay as you go/electronic cash payment. This will create a revolution in money transmission and handling and will have a major impact on consumer behaviour when combined with the information superhighway and a move to the electronic marketplace.'**

Smart cards are the most likely card technology innovation to be used in retail banking. Chapter four highlights the technology trials which have taken place, with particular emphasis on smart cards.

## Chapter 4

### **Technology Trials: The Development and Refinement of Smart Card Technology**

Attitudes towards new technology are often quite intangible and difficult to measure. Some individuals (or organisation) willingly accept it, some avoid it out of ignorance, some are frightened by it and others are waiting 'hands open'. The key to securing retailer and consumer acceptance of a new bank card technology starts with trying to persuade users to take the first step in trying it, and then using all available feedback to make changes to a particular product or process to suit the market. Kline's (1985) non linear chain-linked model of innovation suggests that there are many stages in the research and development process of designing a new product or service, and that successful innovation requires strong interaction between technology suppliers and users. The interface between innovators and the market is complex and must be learned through pilots and trial.

This chapter focuses on the association between product and service development and recent trials of new bank card technology which have taken place in the United Kingdom.

#### **4.1 Developing Products and Services - Technology Trials**

In Chapter two, the five-stage model of the creative process was explained, the final stage of which is product verification, Roy (1986). Having the detailed design of a product or service is to many managers just the beginning. The testing and subsequent market trials which take place may lead to considerable re-design, before final production and distribution begins. Even then, the market will see upgrades as new ideas and subtle changes are made. Consider the computer software industry. No sooner has the consumer purchased version six, than version seven is being launched and there are rumours that version eight is already off the drawing board! Within the retail banking sector, trials are carried out to test and evaluate new bank card technologies for many reasons.

1. To evaluate consumer acceptance of a new technology, in relation to culture and social classification. Relevant questions are; To what extent are consumers aware of the different choices? What attracts the consumer into making a decision to use a Switch debit card for example?

2. **Sorting consumers into homogenous groups which are differentiated by lifestyles and buying behaviour, eg., why would a consumer prefer to use a home-banking computer terminals.**
3. **To evaluate the retailer's perspective and acceptance of a new technology. To identify how to integrate a new technology into existing EFTPoS and ATMs with the minimum disturbance to the general public and the daily functioning of the retail store.**
4. **To evaluate a competitor's reaction and whether it will be 'offensive' or 'defensive'.**
5. **To increase market knowledge through the media publicity - the 'initiator' approach.**
6. **To identify the bank's position in a particular market, adjusting long term strategies as necessary. Should ATMs be upgraded to accept a new technology and provide a wider service? Is fraud an issue?**
7. **To evaluate product / service suitability in terms of cost, hardware durability and life expectancy and ease of further upgrading. To attract the participation of other potential suppliers, to further evaluate and enhance the system design and installation.**

The order of points listed here is important. The market trial feeds data back along the supply chain from consumer and user, to the adopting industry to the technology suppliers. Banks and Building Societies are able to invest considerable amount of capital into testing an idea. The capital cost of running trials can be high. As an example, it is rumoured that Mondex have spent in excess of £100 million in getting their electronic purse to the launch stage in July 1995. This chapter will briefly describe most of the financial card trials that have taken place during the period 1989 - 1995. They have contributed significant feedback for further research and development. Each trial received considerable interest from the media and from competitors, who co-operate as third party observers. They have influence on the outcome of a project and its perceived success in the market as a trend setter - by collaborating and adopting similar standards or by taking the offensive position and providing the market with an alternative choice. Some financial cards not directly associated with retail banking have been included because of their relevance to this research. The chapter concludes with a more substantial focus on the Mondex electronic purse trial in Swindon, one of the largest and most recent trials.

**Project Title:** The Dallington Project  
**System R&D:** Barclays Bank plc, Bull Information Systems  
**Project Manager:** R.C.Townend, Card Technologies Divisional Research Unit, Barclays Bank plc., Nottingham  
**Venue:** Dallington Country Club, Nottingham  
**Technology:** 4KBits Contact Smart Card, Motorola/Bull CP8  
**Date Trial Started:** 1988  
**Update in June 1994:** On-going (2,000 cards per year)

**Venue Description::**

The site chosen was the Dallington Country Club near Barclays Central Research Services Headquarters in Northampton. Dallington Country Club is a multi-sport and fitness club with over 2,000 members across all age groups, with some retailing facilities for food and drink and sports equipment.

**Application:**

To provide all members with a Bull CP8 smart card which can be used for a variety of functions including access control, secure emergency medical data file, electronic purse, court bookings, fitness assessment profile and an incentive programme.

**Main Observations:**

The system is still in use, successfully, in 1994 and demonstrates that smart card technology has the potential to be a multifunction plastic card. Over 35% of the club members bring less cash into the club, with 10% bringing no cash at all. The incentive programme and court booking system is considered to be particularly useful. Refer to Figure 4.1, supplied by Dallington Country Club.

**Project Title:** MeritCard  
**Systems R&D:** Midland Bank plc, GEC Card Technology  
**Project Manager:** Peter Hawke, Card & Electronic Payment Systems,  
**Venue:** Loughborough University  
**Technology:** 5 KByte Contactless Smart Card, GEC Card Technology  
**Date Trial Started:** 1988  
**Update in June 1994:** Trial finished in 1990 as Originally Planned

**Venue Description:**

The Meritcard was only issued to Loughborough University students and staff and only operates on the University campus.

**Application:**

Electronic cash on a 5KByte smart card supplied by GEC Card Technology with PIN. The card was loaded with value at a MCash Loading Station and funds could be spent on a wide selection of products within the on-site bookshop, cafeteria, bar, general store and students union shop. The last 30 transactions could be viewed as an audit trail. By 1990 as the trial came to an end, there were almost 1,000 cards in circulation.

**Main Observations:**

'the initial cards were very unreliable. Many of the complaints about faults with the system, stemmed from the initial batch of cards, of which about a third failed. Towards the end of the two year trial, the cards considerably improved'.

A questionnaire was sent to every card holder following the trial. 61% claimed to have held their card for at least six months - although 20% of card holders had not used their cards, and almost 75% who had used their cards, had experienced some problems during the trial.

**Project Title:** NatWest Byte

**Systems R&D:** NatWest Bank plc., Hitachi/Dia Nippon, Gemplus

**Project Manager:** Nick Walling, Service Manager, NatWest Bank plc.,

**Venue:** NatWest Bank Computer Centre at Goodmans Field, London.

**Technology:** 8KByte Contact Smart Card, Hitachi/Dia Nippon.

**Date Trial Started:** 1992

**Update in June 1994:** Byte is testing the core Mondex Card - see Observations.

**Venue Description:**

Introduced initially as a staff scheme at the bank's London computer centre at Goodmans Field, the aim of the trial was to gain experience in applying smart card technology. The Byte card can be used as a payment card in the restaurants, coffee bars and in a shop at the centre.

**Application:**

In total, 7,432 Byte (release I) cards were issued. These cards were fabricated by Gemplus utilising a SGS Thomson IC. The following devices were installed at Goodmans Field; 12 EFTPoS terminals, 3 ATMs, 3 Branch Dispensers and 9 Enquiry devices.

**Main Observations:**

In April 1994, the Byte (release II) card was launched, fabricated by Dai Nippon utilising a Hitachi IC. This card replaced all release I cards as the two were not inter operable. In October 1994, the one millionth EFTPoS transaction was carried out and the number of cards issued increased to a total of 10,932. On average there are 2,000 EFTPoS transactions per day with over 2,000 'regular' users. The Mondex trial in Swindon is considered to be the next stage in this project.



**Project Title:** Mondex (Refer to chapter 4.2)

**Systems R&D:** NatWest Bank plc., Midland Bank Plc.,  
British Telecommunications plc., De La Rue plc.

**Project Manager:** Tony Surridge, Di Walters., Mondex UK Ltd.

**Venue:** Swindon, Wiltshire

**Technology:** 8KByte Contact Smart Card, Hitachi/Dia Nippon

**Date Trial Started:** Preparations began in 1991  
Press Launch in May 1994

**Update in June 1994:** Phase one begins in April 1995, and is considered  
as the first step towards national implementation.

**Venue Description:**

The Mondex electronic purse scheme is being offered to 40,000 consumers in Swindon, Wiltshire, where most of the towns retailers have agreed to accept payment in this form. By June 1994, over 600 small and large retailers had confirmed participation, including Sainsbury, Boots The Chemist, Laura Ashley, W H Smith, BHS and Safeway.

**Application:**

For consumers, Mondex claims that it 'offers all the convenience, control and flexibility of cash in the familiar form of a card'. Monetary value is stored on the smart card, and can be passed from one card to another or used to pay for goods at the EFTPoS. Monetary value is added to the card by transferring funds at an ATM.

**Main Observations:**

Refer to chapter 4.2.

**Project Title:** Photo Bank Cards, Royal Bank of Scotland plc.,  
**Systems R&D:** Royal Bank of Scotland plc, De La Rue plc.,  
**Project Manager:** Graham Russell, Development Manager  
**Venue:** Initially customers of ten branches located in Edinburgh, London, Glasgow, Brighton.  
**Technology:** Black and white photograph etched onto the card.  
**Date Trial Started:** December 1991  
**Update in June 1994:** Nationwide by end 1993, with over 150,000 of cards in circulation having a photograph of the account holder.

**Venue Description:**

The Royal Bank of Scotland plc., was the first UK bank to introduce a photograph of the card holder on to the front or back of a card. In a trial involving 30,000 of the bank's customers, new versions of the *Highline* card, a combined cheque guarantee card, ATM and SWITCH debit card was issued with a photograph.

**Application:**

Existing magnetic stripe technology with the addition of an engraved B&W or colour photograph of the card holder on the card. A recent photograph is supplied by the customer and sent to the De la Rue bureau in Tewkesbury for scanning and etching when the card is issued. This process adds approximately £1-00 to the cost of the bank card.

**Main Observations:**

There is considerable proof that these cards have reduced fraud. In the initial trial with 30,000 test cards, the total fraud during the two year period for these cards alone was £470, previously in the order of £45,000 for a similar quantity of standard bank cards. It has provided the consumer with greater confidence in the bank and the scheme has been introduced nationally.

Over 70% of new applicants for the banks MASTERCARD ask for a photograph to be added to the card showing, according to the bank, that 'customers want to show some responsibility to the bank'.

Despite the success of this 'trial' a spokesperson for the bank confirms that 'the photocard is only the bank's short-term solution to the fraud problem - there is most certainly a case for smart cards'.

**Project Title:** Photo Bank Cards, TSB Bank plc.,  
**Systems R&D:** TSB Bank plc., NBS Ltd.,  
**Project Manager:** Tony Plummer, Philip Cresswell.  
**Venue:** Initially customers of branches located in the Brighton, East Sussex region.  
**Technology:** Colour photograph is etched onto the card.  
**Date Trial Started:** February 1992  
**Update in June 1994:** 50,000 cards issued.

**Venue Description:**

Initially customers of branches located in the Brighton, East Sussex region.

**Application:**

A colour photograph is etched onto the bank card at no extra cost to the card holder. An initial batch of 20,000 cards was targeted in 1992 out of a total card base of over 3.5 million VISA Trustcards (credit cards).

**Main Observations:**

The photograph has helped to reduce fraud to some extent, although not by a huge amount - it stops the use of cards not received, as the fraudster decides to locate cards from other banks. It is regarded as a medium term option until smart cards are introduced and TSB may add photographs to other bank cards.

**Project Title:** **Photo Bank Cards**  
**National & Provincial Building Society**

**Systems R&D:** National & Provincial Building Society.

**Project Manager:** Nigel Wren

**Venue:** UK

**Technology:** Black & white photograph is etched onto the card.

**Date Trial Started:** February 1992.

**Venue Description:**

All cards in the UK, by request of the card holder at the time of being issued.

**Application:**

A black and white photograph is etched onto the bank card at no extra cost to the card holder.

**Main Observations:**

Successful in reducing bank card fraud, although no other advantages. Similar feedback to the Royal Bank of Scotland and TSB technology trials.

<b>Project Title:</b>	<b>Photo Bank Cards, Countries other than the United Kingdom</b>
France	Introduced, but withdrawn - people refused to have photographs.
U.S.A.	Idea toyed with, but rejected on the grounds of cost.
New Zealand	Trustcard ran an experiment for 18 months, but abandoned it because it did not reduce fraud enough to pay for the additional costs.
Ireland	Card fraud eliminated at Cork Savings Bank plc.,
Norway	Successfully introduced.
Finland	Successfully introduced, but retailers have an incentive - they must pay for fraudulent transactions.
Denmark	Successfully introduced.
Belgium	Not tested.
Italy	Not tested.
Germany	Various banks and technology suppliers are evaluating the idea of starting a trial, against the potential introduction of smart cards.

**Project Title:** VISA Watermark / Holomagnetics / Smart Card

**Systems R&D:** VISA (EMEA Region)

**Project Manager:** Jean Jacques Desbons VISA EMEA (based in Paris, France),  
Ed White, Thorn Secure Science International Ltd.

**Venue:** Trials in USA.

**Technology:** Specific trial to evaluate both Watermark Magnetics  
and Holomagnetics for Credit Cards.

**Date Trial Started:** 1992

**Update in June 1994:** VISA confirms that their strategy is towards smart cards.  
Developing this strategy with Gemplus and Verifone.

**Venue Description:** Trials in USA.

**Application:**

Introduction of additional features to VISA credit cards to reduce bank card skimming.

**Main Observation:**

The main impetus behind the move into smart card technology comes from the EMEA region (Europe, Middle East and Africa) where a special team based in Paris is preparing a paper outlining VISA International's smart card strategy for the 1990s. This is in conjunction with work carried out by a similar team in San Mateo, California, U.S.A.

There are four suggestions which are being considered. 1 - Do nothing, 2 - Protect the magnetic stripe with holomagnetics or watermark magnetics, 3 - Adopt a smart card only policy or 4. Combine the smart card and magnetic stripe technologies.

The electronic purse campaign described below is a key initiative by VISA, aimed at developing a common standard for payment cards worldwide, already agreed with MASTERCARD and EUROPAY. This consortium is known as EMV. VISA are also developing a smart card electronic purse which will be called 'VISA Cash'. This is targetted at low-value purchases, and may be purchased as a disposable or reloadable smart card.

VISA are looking for 'Interoperability, Security and the capability to interchange across country borders and systems'.

**Project Title:** Europay International Express Card  
**System R&D:** Europay International, Brussels, Belgium.  
**Project Manager:** Richard Phillimore.  
**Venue:** Europe, initially Belgium.  
**Technology:** EEPROM Smart Card - other details confidential.  
**Date Trial Started:** Late 1995.

**Venue Description:**

Described by Europay as the electronic purse for Europe.

**Application:**

Europay Express is initially targeted at low value transactions up to about ECU 20.00 confirms Richard Phillimore. The card will be able to hold more than one currency and each bank can add its own unique services.

**Main Observations:**

Europay is working independently as well as collaborating within the EMV group.  
No information available from Europay in November 1995.



**Project Title:** Mastercard Electronic Purse  
**System R&D:** Mastercard International  
**Project Manager:** Nancy Elder  
**Venue:** Asia-Pacific Region  
**Technology:** EEPROM Smart Card - other details confidential.  
**Date Trial Started:** Late 1995.

**Venue Description:**

Described by Mastercard as a global payment system.

**Application:**

The participating banks are Standard Chartered (Singapore), Westpac, ANZ and The Commonwealth Bank of Australia (Australia).

**Main Observations:**

This trial is attracting the media's attention, although delays and secrecy are keeping project data to a minimum.

**Project Title:** Marks & Spencer Staff Discount Card

**Systems R&D:** Marks & Spencer Plc., London. SGS Thompson supplying Ics. Cards manufactured by McCorquodale Card Technology.

**Project Manager:** Robert Bennet, Marks & Spencer plc.,

**Venue:** Trials in Kingston, Surrey and Kensington London.

**Technology:** 256 byte EEPROM Smart Card

**Date Trial Started:** April 1993

**Update in June 1994:**

Following successful trials in Kingston and Kensington, the system was introduced in over 300 other stores before the end of 1993. Nationwide implementation continues. At this stage, M&S were confining the scheme to the UK, although it may spread to other European branches in future.

**Venue Description:**

A staff discount card, introduced to replace the existing books of discount vouchers which are given to staff. Following the initial trial, over 60,000 cards were issued to UK staff.

**Application:**

The smart card is preloaded with the staff member's allowable discount which is then used for purchases. The cards are reusable and can be reloaded with additional discount every six months, as required. Each store has 5-9 terminals, manufactured by Dione Developments.

**Main Observation:**

Although denied by Marks & Spencer, it may be possible that the company will switch its in-store account card over to smart card technology in order to assure further customer loyalty and value-added promotions in due course. There is also increasing discussion about when Marks & Spencer will start accepting VISA and MASTERCARD at the EFTPoS.

**Project Title:** The Quantum System

**System R&D:** British Gas plc., Smart Cards supplied by Gemplus in France and ICs by SGS Thompson. Hardware developed by Landis & Gyr Energy, UGI and Newcastle Polytechnic.

**Project Manager:** Peter Stoddart, British Gas plc.,  
Martin Pollock, Landis & Gyr Energy Management (UK) Ltd

**Venue:** Initially in the Midlands

**Technology:** 2K Byte EEPROM Smart Card

**Date Trial Started:** January 1992

**Venue Description::**

Utility (gas) payment.

**Application:**

Consumers load cash onto a smart card at selected retailers. New tariff changes and any special arrangements regarding payment of outstanding debts is also down loaded onto the card, via the payment terminal. Back at home, the consumer loads the balance on the card into the meter which also updates the same card with the meter reading for future reference.

**Main Observations:**

Total investment over £130 million, almost 250,000 meters installed and 6,000 charging terminals located in newsagents, Post Office and small grocery stores. Forecasts by British Gas suggest that there will be over 1.5 million meters installed by the end of this decade. British Gas is now looking for third-party use of its 'Quantum' cards. A prepayment scheme for television licences. Trial started in April 1994.

**Project Title:** TV Licence Savings Card

**System R&D:** BBC TV., British Gas plc., Smart Cards supplied by Gemplus in France and ICs by SGS Thompson. Hardware developed by Landis & Gyr Energy.

**Project Manager:** Peter Stoddart, British Gas plc.,

**Venue:** 11 Newsagents in White City, London.

**Technology:** SGS Thompson/ COS 16K bit Smart Card

**Date Trial Started:** April 1994

**Update in June 1994:**

The trial is proceeding to plan and with over 20 million TV licence holders in the UK, there is considerable potential for this application.

**Venue Description::**

Consumers load cash onto a smart card at any one of eleven selected retailers, instead of purchasing stamps at the Post Office. During the initial trial, the card is sent to the television licence authority so that the value on the card can be contributed towards the cost of a licence.

**Application:**

Television Licence pre-payment.

**Main Observations:**

The scheme has been well accepted to-date. Eventually, consumers will be able to pay their licences at Post Offices by inserting their card into a reader and having the appropriate fee deducted.

**Project Title:** Jersey Card

**System R&D:** Jersey Card Ltd.

**Project Manager:** Chris Parlett

**Venue:** Jersey - a selection of retailers and the island's community.

**Technology:** 416 bit secure memory EEPROM Smart Card.

**Date Trial Started:** February 1991

**Venue Description:**

Jersey, largest of the Channel Islands, population approx. 85,000 people.

**Application:**

One of the first multi-function smart cards which can be used for payments such as car parking, health club membership, utilities payment and retail purchases. Only a minority of retailers will accept the card, without around 600 payment terminals being installed on the island.

**Main Observations:**

With limited success. Retailers and consumers would appear to divide into two groups - one group is very optimistic towards the future of the Jersey Card project and the second refuse to be involved in the scheme. The scheme continues with limited growth. A relaunch has been planned for Winter 1995.

**Project Title:** 'WaterCard' Budget Payment Scheme

**System R&D:** GEC Meters Ltd., Kent Meters Ltd., Philips / Gemplus,  
De La Rue Fortronic Ltd., Initial trials by Wessex Water plc.,

**Project Manager:** Steve McKeivitt, GEC Meters Ltd

**Venue:** Initial trials were organised by Wessex Water plc.,  
although this is now being extended.

**Technology:** Philips / GFM 2K Bytes EEPROM Smart Card.

**Date Trial Started:** October 1992.

**Update in June 1994:**

Regarded by the water industry and outside observers as being a very successful trial.

**Venue Description:**

Initially in the Wessex Water customer base, although extending nationally.

**Application:**

Prepayment of water charges using a smart card which can be loaded with between £1 and £10,000 value. The card is unique to the card reader at the customers base and cannot be used in any other meter. The cardholder inserts the card into the home unit and the amount credited on the card is transferred to the unit. Emergency supply is provided for up to seven days once the meter credit has been finished.

**Main Observations:**

According to some water companies, around ¾ of customers who are summoned for non-payment of their water bills are eventually disconnected. For certain customer profiles, this scheme has proved a total success and over ten other water companies already have or are planning to introduce the scheme. Welsh Water plc., Seven Trent Water plc., Bristol Water \plc., and the Southern Water Authorities are particularly interested.

**Project Title:** 'Smart Power' Budget Payment Scheme

**System R&D:** Midlands Electricity plc., Hardware developed by Landis & Gyr Energy, De La Rue Fortronic Ltd.

**Project Manager:** Mike Simpson, Midlands Electricity Ltd.,

**Venue:** Customers in the Midlands Electricity Region.

**Technology:** K Byte EEPROM Smart Card.

**Date Trial Started:** April 1994

**Update in June 1994:**

Seeboard and Manweb are considering their own schemes 'Smart Power' continues to expand in the Midlands region.

**Venue Description:**

Utility (electricity) prepayment. A smart card scheme introduced to replace 200,000 token prepayment meters in the midlands region.

**Application:**

Cards are sold in various retailers and Post Offices, each being unique in only working in one meter, making theft and fraud pointless. The card provides a two-way flow of data about consumption and potential bad-debt situations which all utility companies wish to avoid.

**Main Observations:**

In the original trial, 48% of consumers claimed that they would like to continue with the system. Potential high costs of updating meters with smart card technology was initially a concern, although the unit cost (around £120) is falling. Midland Electricity is probably one of the more innovative and wants its own specification to be adopted by other electricity companies. Although other electricity companies have magnetic stripe based systems (with its fraud problems), only two are currently investing into smart card or another alternative technology.

**Project Title:** National UK Identification (ID) Card

**System R&D:** HM Government and various suppliers still to be decided in due course.

**Project Manager:** The Secretary of State.

**Venue:** UK national introduction.

**Technology:** To be confirmed.

**Date Trial Started:** To be confirmed.

**Venue Description:**

The population of the United Kingdom, possibly not compulsory.

**Application:**

National identity card with the potential to become multifunction - typically passport, driving licence, benefit and medical records on one cards. During the early stages the card may be voluntary rather than compulsory, although this depends on the feedback following the Green Paper.

**Main Observations:**

Green Paper published by the PM John Major in May 1995 as a general discussion document. Suggestions include the use of smart cards with a minimum three year life, costing less than £5-00 to supply and issue to each UK citizen. Consultation to be complete by the end of 1995 and whether this will then lead to the national introduction of a national ID card is debatable. There is considerable resistance from some Ministers in the present Government and debate over the introduction of 'smart' driving licences. Green paper - May 1995.



## **4.2 The Mondex Electronic Purse**

As the most significant electronic purse trial in the UK this decade, Mondex has been given its own sub-heading in this thesis. Mondex is a joint venture by the Midland and National Westminster Banks and British Telecom. Following three years of product development, the electronic purse scheme went live in July 1995, with the initial target for 40,000 smart cards to be issued with over 1,000 retailers accepting the cards, initially in Swindon. Electronic cash can be transferred at public telephone kiosks or by using the small transactor terminals which cost £15 each or £3.50 per month and are similar in size to a small electronic calculator.

The main concern during the early days of Mondex centred around losing a card, and therefore the money on it. With no audit trail, the card holder is unable to prove the value remaining on the card at the time of the loss. Many critics claim that this money will effectively be added to the bottom line profits of the banks. Mondex claim that they will address each claim on an individual basis, providing a refund where possible. Di Walters, Marketing Manager at Mondex explains that

to ensure that the electronic purse cannot be used by anyone else, the holder can lock the card. This can be done at a cashpoint, a BT phone or by using the [transactor] wallet by using a self selected PIN or code. Once locked, the money cannot be spent without keying in this code. Cash means different things to so many people, that there would probably be a stepped limit available depending upon earnings and age [Mondex will also be targeted at teenagers in due course].'

This of course does not help prove the value remaining on a lost or stolen card. Within two months of launching Mondex, the management team re-visited this important consumer concern. The monthly fee of £1.50 now includes insurance for 'lost' cash up to a maximum value of £100, a further example of Kline's model of innovation, with market feedback suggesting that this modification to the 'product' is required to help it succeed in a competitive market. As an incentive, new applicants signing up before February 1996 will have the Mondex card free for the first six months, a desperate approach to attract more consumers according to some newspapers. The sample of consumers questioned for this thesis gave a positive response (81%) to the suggestion that an audit trail should be stored on a bank card. Has Mondex listened carefully to the consumer? Mondex claims that consumers do not want audit trails because of the fear of 'big brother watching you'. Most critics suggest that a back-office audit trail is necessary. Mondex disagree - at the moment!

Mondex claim that the scheme is proving very successful and it is too early to evaluate this trial. Managers at National Westminster Bank are quick to describe Mondex as a 'scheme' and not a 'trial' claiming that it is destined to be the future of cash. However, it has cost a rumoured £100 million to implement and as one journalist explains, 'there will be some very red faces, not least that of Tim Jones the Chief Executive, should the scheme disappoint the industry'. The cost of the smart card as sold to Mondex is around £10.00 and Walters confirms that

'the cost of supplying the card [scheme] to the consumer is driven by the market and if it was free of charge we would be kidding ourselves - the banks wouldn't make any money. As more cards are issued, we will see the unit cost coming down. At the moment we cannot charge what the market will not bear. Both the retailers and the other banks who offer Mondex will initially have to absorb the costs of upgrading ATMs and EFTPoS terminals. As I said earlier, the scheme is very much market driven and the success depends on how the consumer accepts it.'

Security is tight at Mondex. Trying to arrange an interview was almost impossible. Consumers have complained about the long delivery times required to receive a card. This is apparently explained by the security procedures Mondex have adopted before issuing a new card. Fraud should then be eradicated. Walters admits that no technology, smart card included, is 100% secure, although the integrity of Mondex depends on the internal security adopted in the card issuing process. According to Mondex, biometric security will be adopted by the retail banking industry, and CEO Tim Jones mentioned casually at the Smart Card '95 event that fingerprint recognition would be the winner.

The standards specified by Mondex are different to that of the EMV (Europay, MASTERCARD, VISA) draft standards, in the protocol used between the card and external interface device. Mondex has every intention of getting its electronic purse licensed in as many countries as possible and is unashamed at the expense of achieving this through high profile marketing and PR activities. Walters describes Mondex as being 'the only global payment system using an electronic purse'. The Mondex smart card consists of a 8K byte EEPROM IC, of which only half is used. Mondex have suggested that there are endless opportunities for the remaining 4 K Byte of memory, including customer loyalty and the adoption of other payment schemes on the card - EMV for example. The only competition are the credit and debit card issuers who have other plans through EMV and APACS in the UK, and the many electronic purse trials taking place in most other EU countries.

According to Walters, the preparation of standards is only one concern for Mondex, the vital issue being the conversion of existing ATMs and EFTPoS terminals to accept the card. Critics do not believe that Mondex will fund this enormous national expense themselves - neither do Mondex. There will have to be more cooperation for Mondex to be the success story of the 1990's. Tony SurrIDGE confirms the importance of working closely with the retailers to make a success of the scheme.

'If the retailers do not accept the card terminals, then we do not have a Mondex scheme - therefore we are now working very closely with both the smaller and larger retailers, in order to develop integrated solutions'.

Oliver Randell, IT Manager at Sainsburys agrees with SurrIDGE.

'Mondex really must talk to the retailers and consumers....otherwise they will just go bumbling along. Up to now [September 1995] we have found more things to criticise than praise and our views really should find their way back to Mondex if this scheme is to be improved'.

In Touch (1995) reviews the initial experiences of Mondex. Two months into the Mondex trial, it was suggested that many Swindon retailers were unable to handle the cards efficiently. There were many Mondex EFTPoS terminals tucked under counters and shops that admitted that three or four Mondex transactions a week were the most they had processed. According to Walters, this slow take-up of Mondex by both retailers and consumers is in part deliberate, being spread over two years. Midland and National Westminster Banks claim that they are trying to emulate what a national roll-out might be like. This would be over a period of time and would involve interfacing with EMV at some stage, so that retailers only have one terminal. In July 1995, the Sunday Times newspaper carried out a survey of 152 retailers in Swindon who accept the Mondex electronic purse. Over 60% suggested that fewer than ten customers had used the card in their shops, and 18% of the retail staff had not heard of Mondex, despite many of them living in Swindon or the surrounding areas. Walters explains that the average amount of money kept on the card during the early stages of the scheme was £25, although this is increasing as consumers become more confident of the scheme. The management team at Mondex headquarters in London are not deterred by the negative press received. The important issues will focus on sustaining interest in the scheme. Being strictly curtailed by banking codes of practice about sending unsolicited cards to their account holders, Mondex are keen

to recruit advocates of the scheme, who are willing to recommend the electronic purse to other potential users.

For the long term, Tim Jones, the CEO of Mondex, is quite relaxed.

I welcome the competition with EMV. Of the 30% of the payments market that the electronic purse will take, Mondex will hold between 63% and 83% with other schemes taking the rest. I think they're going to struggle to have significant market presence, because intrinsically, they do less than Mondex for both card holders and merchants and they will cost more because you have to account for individual transactions. They're not money, but pre-authorised debit cards'.

In Touch (1995)

### **4.3 Market Acceptance is Reliant on some Collaboration.**

All of the above trials share one important characteristic. They are all closed trials within a particular timescale and geographical location. The rate at which a new innovation is adopted, is reliant on how the industry standards are agreed, and how well the innovation is communicated to the market. The advantage of having an industry-wide monopoly infrastructure is illustrated by the example of the British Gas and Quantum payment system.

Existing as a monopoly, British Gas can develop its own standards and introduce new technology, only requiring the approval of 'Ofgas', the industry regulator. The success of Quantum must in large part be due to this fact.

An opposite example is the typical experience within the retail banking market which consists of many smaller players, all trying to agree standards and provide technology and market feedback onto a very large 'stage'. During the second part of this thesis, we focus more on these individual groups - the technology suppliers, banks, building societies, retailers, consumers and the other groups which have something to contribute. Each of these groups were studied using a variety of qualitative and quantitative surveys.

## Chapter 5

### The Technology Supply Industry

Product innovation is very dependent on the balance between technology push and market pull, the basic principles of which were considered in chapter two of this thesis. In this study of retail banking, we have defined four key groups of technology suppliers who supply the financial and retail organisations with their systems hardware and consumables: the card manufacturers; the EFTPoS system manufacturers; and, the ATM manufacturers. There are many other smaller groups who are subcontracted by the main suppliers, such as software programmers and installation and service contractors. There are also those technology suppliers that install the banking network and telecommunications hardware/software for on-line encryption and processing of bank card data.

The shift towards electronic transactions is forecast to continue as more consumers use debit cards as a method of payment at the point of sale. To a supplier in this industry, it is obvious that the 'cake' or size of the potential market for EFTPoS hardware is growing considerably. At the same time, there are more suppliers hoping to obtain some market share of this 'cake'. During 1994 and 1995, according to records held at Companies House, twenty two new limited registered companies in EFTPoS hardware were formed. Technology suppliers must invest in research and development to gain technological advantage, but must avoid moving too fast for fear of taking the wrong approach in relation to the rest of the industry. A common question asked among suppliers is 'should we adopt an open or closed system - in fact, how do we develop an open EFTPoS / ATM system that will operate within such a global market?'

A 'plug and play' solution is the ultimate solution, although this depends on obtaining the agreement of all banking organisations to follow common standards. This is just one issue of several considered in this chapter. The data was obtained from a selection of Bank Card, EFTPoS and ATM system manufacturers via a questionnaire sent out in 1994, which was followed-up by telephone to discuss industry trends and proposals for new bank card technology.

## **5.1 Interviewing the Technology Supply Industry**

It is important to distinguish between ATM and EFTPoS manufacturers, as the exact nature and use of the system hardware varies considerably between them (see chapter three). The EFTPoS hardware usually consists of the swipe or manual insertion reader at the retail EFTPoS, together with a data processing terminal for card verification. This may be processed on-line or off-line. Only the checkout staff employed by the store will use this equipment. The ATM hardware consists of a motorised card acceptor and is used only by the consumer. I have identified the market leaders for consideration. These are listed in Figure 5.1, in no relevant order. The manufacturers marked with an asterisk are considered by the industry to be the market leaders in their respective field, based on their annual sales turnover specific to banking applications and current market opinions. Note that three of the system manufacturers support both ATM and EFTPoS hardware, although their main interest has been underlined.

The manufacturers listed were sent a questionnaire during January 1994 (see Appendix One). The main objective was to question their opinions and ideas on the suitability and choice of card technology available to the banks; which organisations are the most influential? and what they believe industry and market requirements actually are? Every company responded, after more than one questionnaire had been sent and telephone contact achieved. On receiving back the survey, I telephoned each respondent to discuss their comments in greater detail. Almost 25% of the sample were willing to discuss their views in some detail, 10% being market leaders to the adopting industry.

The data resulting from the interview process was collated and used to make the following industry and market observations on card technologies. Data from other sources is also considered highly relevant in this chapter and has been referenced where applicable.

**Figure 5.1 Technology Suppliers - Market Leaders in the UK.**

COMPANY	LOCATION	TECHNOLOGY
McCorquodale Card Technology Ltd (owned by De La Rue)	Lewes	All Bank Cards
De La Rue Card Technology Ltd*	Tewkesbury	All Bank Cards
Datacard Ltd*	Havant	All Bank Cards
National Business Systems Ltd (NBS)*	Byfleet	All Bank Cards
Thames Estuary Plastics Ltd (TEP)	London	All Bank Cards
ID Data Systems Ltd	Corby	All Bank Cards
Thorn Secure Science International Ltd *	Swindon	Watermark tape
Motorola Ltd*	Glasgow	Smart Cards
Gemplus Ltd*	London	Smart Cards
US <sup>3</sup> Ltd	High Wycombe	Smart Cards
OKI Semiconductor Ltd	Slough	Smart Cards
Siemens Semiconductors Ltd*	Bracknell	Smart Cards
Hitachi Europe Ltd	Maidenhead	Smart Cards
GEC Card Technology Ltd*	Walsall	Contactless SmartCards
Control Module Inc.,*	Enfield, U.S.A.	Holographics
West Lamination GmbH (EU Office)*	Hamburg	XSec Security
Drexler & Nippon Conlux Ltd*	London	Optical Cards
Canon Ltd	Birmingham	Optical Cards
Omron Tateisi Electronics Corp.,	Henfield	Optical Cards
Euclid Ltd	Havant	Systems R&D
Barnes International Marketing Ltd	London	Systems R&D
Kenrick & Jefferson Ltd	Walsall	Bureau Services
Card Code Ltd	Croydon	Bureau Services
NCR Ltd (AT&T Group)*	Scotland	<u>ATM</u> and EFTPoS
ICL Retail Systems Ltd*	Maidenhead	EFTPoS
IBM Retail Business Ltd*	London	<u>ATM</u> and EFTPoS
Siemens plc*	Bracknell	<u>ATM</u> and EFTPoS
Olivetti Ltd	London	EFTPoS
Bull (Telesincro)	London	EFTPoS
Riva Systems Ltd	Uxbridge	EFTPoS
Omron Systems (UK) Ltd	Chessington	EFTPoS
Casio Electronics Co. Ltd	London	EFTPoS
Edacom Data Systems Ltd*	Mountfitchet	EFTPoS
GEC Avery Ltd	Warley	EFTPoS
Delphic Card Systems Ltd	Tewkesbury	EFTPoS
De La Rue Fortronic Ltd	Dunfermline	EFTPoS
Verifone Ltd	Harefield	EFTPoS

**Source:** G Bozall, Open University

## **5.2 Which Organisations Influence Bank Card Innovation?**

Which organisations influence 'market demand' and 'technology push'? There is evidence that the innovation 'push-pull' process is not evenly balanced at all. In this application, it seems that one major organisation needs to 'take the leap' before the others follow.

Returning to my original argument for a moment, Richard Barras suggested that, in the past, a corporate-led model was dominant in the early stages of the financial services revolution. The 'Reverse Product Cycle' was proposed by Barras in 1989. Described in chapter two, it explains how large established companies in the retail banking industry are dominant in evaluating and accepting incremental innovations in the initial stages of a new product or service. This later leads to more radical process innovations that affect complete systems, on a national or international basis. This survey suggests that Barras' observations still holds, particularly with the approach taken by VISA, Mastercard, Europay and the four largest clearing banks (National Westminster, Midland, Barclays, and Lloyds) having strong control over new bank card developments in the UK. These large organisations tend to develop many small innovations, while carefully observing the actions of their competitors. Some collaboration is needed, as no single company is prepared to 'go it alone' with a radical innovation on a national scale. Technology suppliers recognise the potential damage of moving forward in one direction, only to find later that industry standards have been approached from a different angle.

Consider some of the observations resulting from the survey. Certain organisations were identified as having greater influence on technology change and innovation of bank card technology. See figure 5.2. EMV and APACS are the most influential in guiding the technology supply industry forward.. Further discussion with the respondents also indicated that APACS has a lot of indirect influence in supporting and promoting the actions of the banks and building societies in the UK as their media representative. The scenario was well summarized by a senior manager at De La Rue Card Technology who claimed that

'in the UK, bank technology is governed by APACS, although in reality, it will take a major initiative by VISA or Mastercard to force the UK banks to move'.



**Figure 5.2 Who has the greatest influence on when and how card technology will be changed in the retail banking sector?**

	Type of Manufacturer		
	EFTPoS	ATM	CARD
Four Main UK Clearing banks [APACS]	1	2	1
VISA and/or Mastercard and/or Europay	2	1	2
Other UK Banks	3	4	3
Retailers	4	6	4
Building Societies	5	5	5
UK Government	7	8	6
Technology Suppliers	6	3	7
Progress/Failures in other Countries	8	10	8
Media Reporting and Publishing	10	7	9
Consumer Attitudes	9	9	10

'1' indicates more influential, '10' less influential

**Source: G Boxall, Open University**

We can develop this idea further. The view that APACS was the most influential partner in the UK, whilst VISA would take the lead internationally by suggesting the industry standard for any change of card technology was strongly promoted by all card manufacturers. The reverse was suggested by a few of the EFTPoS and all of the ATM systems suppliers (Siemens Nixdorf and AT&T in particular) who see Europay, Mastercard and VISA jointly as EMV being the very dominant lead partner in the UK. Many hardware manufacturers stressed how important the EMV standards are, in that they define the hardware and software protocol at the most basic level for a global solution. The task of interfacing new card technologies with existing magnetic stripe technology must be endorsed by EMV before any national implementation can be successfully managed. In this rather complex situation, standards setting is key, and radical innovations by one technology supplier is extremely risky. Market trials such as that of Mondex in Swindon attach momentum to innovation and may allow Midland and National Westminster banks to take the technology lead, if only for the short term. Even if Mondex is not successful in setting industry standards for the UK, other financial groups are likely to be forced into deciding whether to collaborate or compete with these two banks.

APACS was set up in December 1985, and in June 1995 had twenty two members. For this reason, whilst the organisation would not perhaps publicly support and commit to a specific technology, it may endorse the work of its competing members. It is important to note opinions obtained in interviews on the influence of the technology suppliers. The ATM/EFTPoS manufacturers appeared to be more confident in suggesting that technology suppliers are positioned higher in the influence structure, whilst bank card manufacturers claim that technology suppliers have a more modest seventh position! There are two possible explanation. Either the ATM/EFTPoS manufacturers have a closer affiliation to the banking community, believe that in fact they have earned the respect of that community and are quite influential in the development of new technology. Alternatively, the card manufacturers are more realistic and appreciate that whilst the technology push, market pull equilibrium continues, bank card technology is very market driven.

### **5.3 Conviction towards New Bank Card Technology**

Smart card technology was understood and supported by the majority of companies [75%], with further investment under way to adopt the technology by companies not already doing so. There is a view that technology suppliers 'do not want to be left in the wings, should the changeover proceed'. None of the UK manufacturers actually support Holomagnetics, although they would definitely consider supporting it if the market demanded it. There appears to be limited understanding of how Holomagnetic technology actually works and is described as being 'relatively new with more mature technologies being favoured for this application'. This could be a result of the patent holder of holomagnetics, Control Module Inc., trying too hard to promote it to VISA before the EFTPoS equipment manufacturers.

One senior manager confirmed that

'Control Module are concentrating too hard on VISA and Mastercard, without working more closely with the bank card, EFTPoS terminal and ATM manufacturers....perhaps resulting in its own future demise!'

This illustrates a very typical situation. In order for the innovation to be successful, the inventor (or agent) needs the support of the manufacturing industry as well as other actors. This is to provide applications research and development, eventually to promote and market the innovation to the end-user, in this case, the banking organisation internationally and the retailers. Watermark Magnetics is suggested by many bank card manufacturers as

a solution to the fraud problem and the industry has a high regard for this 'invention' by Thorn Secure Science International [TSSI]. One technical engineer highlighted the main concern,

'if only they [TSSI] had marketed the product properly in the beginning, it could have made a great success in this industry. They are too late!'

This could explain why only 35% of the technology suppliers contacted support Watermark Magnetics and only 5% may consider investing into the equipment and expertise required to manufacture Watermark bank cards in future. The EFTPoS/ATM manufacturers also have a high regard for the principles of watermark technology, but they do suggest that they would only build hardware to accept watermark cards under the following circumstances. Either the technology is chosen as a long term option for bank cards or TSSI commit to forming semi-exclusive business partnerships, offering a more substantial solution to help reduce bank card fraud. The impression given by TSSI would seem to suggest other plans - their technology is so good, it will more than likely be adopted for retail banking in the UK. This will attract hardware contracts from numerous EFTPoS/ATM manufacturers, all offering to absorb tooling charges to provide a new range of EFTPoS/ATM products for TSSI to offer, either direct to the banks and retailers or sell under license through other suppliers. A senior manager from a EFTPoS hardware manufacture explains that

'this approach by TSSI is despite the fact the VISA have already made a firm commitment to smart card technology. They should be concentrating on protecting their core markets'.

#### **5.4 Technology Suppliers and Bank Card Fraud**

How do the three groups (card manufacturers, ATM and EFTPoS hardware suppliers) regard existing levels of bank card fraud? Generally, all respondents agreed that the level was high and that the banks are increasingly concerned, with two main observations;

'The high cost of major infrastructure changes is preventing the banks from introducing new technology' (Datacard) and 'The banks can live with the present levels of fraud, but are fearful of the future, particularly with the threat of increasing counterfeit fraud' (NBS).

The fear of organised fraud, in particular counterfeiting, remains a major driver to the industry as a whole. The realisation that magnetic stripe bank card technology has been in use for almost twenty five years and is reaching the end of its life cycle is apparent.

However, the general consensus is that the introduction of smart card technology for bank cards cannot be justified on projected fraud savings alone.

As technology supply innovators promote alternative solutions, there appears to be a steady increase in the market demanding a replacement for the magnetic stripe. As the professional fraudsters knowledge increases, innovators are trying to remain at least one step ahead. One EFTPoS systems manufacturer explains that

'the banking network is now so large, there are too many suppliers needing to learn about the technology, as well as too many suppliers learning about the technology' [De La Rue Fortronic].

This manufacturer is suggesting that as more suppliers come on-line, it becomes more difficult to agree common standards for the industry. At the same time, the security benefits offered by smart cards are more likely to be compromised if more people know the procedures involved for checking cards at the retailers' EFTPoS terminal or ATM. This together with the increasing use of computers and EDI results in more professional fraud. Manufacturers believe that they are distant from the fraud problem. They claim that it is the responsibility of the banking community to protect the interests of the consumers and retailers and maintain consumer confidence. In the view of a EFTPoS consultant working with ICL, much of the card fraud problem has been caused by the banks who eagerly distributed EFTPoS terminals and credit cards during the late 1980s.

'The problems relating to fraud have been of the bank's own making in allowing insecure systems to proliferate'.

This comment refers to both the published levels of fraud as well as the potential fraud

'which may cause major future problems such as allowing millions of current account transactions to be processed in clear text on retailers networks and computer systems - a practice which would have been unthinkable is suggested ten years ago'.

This particular consultant blames the de-regulations of 1989 for much of the problem with the competitive rush that it brought the banks and building societies. This followed the UK Monopolies and Mergers Commission report on '*Credit Card Services*' which confirmed that the banks were charging retailers too much for being able to offer credit card facilities. As a result, merchant retailer charges fell during the following months. As they leapt on to the card issuing and merchant acquisition market, 'all normally provident behaviour went

out of the window'. There is no obvious argument against these observations, and some critics go further in suggesting that the quoted levels of fraud are lower than the actual figures. Four bank card manufacturers supported this view strongly.

## **5.5 Blaming the Banks**

The manufacturers appear to support the retailers (see chapter eight) discontent quite strongly. Between 1987 and 1991, before the recession took hold, there was a steady increase in the number of EFTPoS terminals in the high street (from about 30,000 in 1987 to over 100,000 by December 1989). One suggestion is

'that the banks have created today's problems by being too enthusiastic in developing the market with loss leading EFTPoS terminals placed with retailers for as little as £10 per month....by 1993, this had increased to around £40 to cover earlier losses'.

It is clearly evident that 'higher retail (merchant) charges are being used to finance the bad lending decisions of the banks' one supplier said. One of the problems with interfacing a new technology is that banks do not understand the implications of integrating complex retail systems.

'Bank thinking is predominantly based on their own EFT terminals and networks - they think at the level of tills, not systems'.

This view is changing with time, as a global appreciation becomes more important for the long term, either in the UK, EU or Worldwide. The technologists take the attitude that they have to hold the hands of and guide the financial community through the technology maze. Many suppliers suggest that banks direct any financial risk resulting from poor decision making towards the technology supply industry, with the research and development overheads being financed by the technology supply industry.

## **5.6 The Preferred Technology**

So which technologies are the most suitable and which will actually be adopted and are they the same? Refer to figure 5.3 which illustrates that there are very definite views. The choice of Holomagnetics and XSec was discussed with all manufacturers, and whilst many agreed that both technologies were of general interest to the magnetic card industry as a whole, no one company believed that either technology would be used on bank cards in the

future. Over 46% of the companies contacted had very limited understanding of either security process, although every company contacted had heard of both Holomagnetics and Xsec. Figure 5.3 gives some feedback from two questions. Which technology is the most suitable for bank cards? And, which is the most likely to be adopted in future? Two of the three supplier groups put watermark magnetics below smart cards and photo-ID cards as the least suitable and least likely to be chosen.

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**Figure 5.3 The Choice of Technology**

**Which technology is the most suitable for bank cards?**

	Type of Manufacturer		
	EFTPoS	ATM	CARD
Smart cards	2	1	1
Magnetic stripe with Photograph	1	2	2
Watermark Magnetics	3	3	3

'1' indicates more suitable, '3' less suitable

**Which technology is the most likely to be chosen?**

	Type of Manufacturer		
	EFTPoS	ATM	CARD
Smart cards	1	1	1
Magnetic stripe with Photograph	2	2	2
Watermark Magnetics	3	3	3

'1' indicates more suitable, '3' less suitable

**Source: G Boxall, Open University**

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EFTPoS hardware manufacturers suggested that a photograph of the card holder on an existing bank card offers direct identification. In trials carried out by the Royal Bank of Scotland plc., the addition of photographs has helped to reduce fraud - as highlighted in the trial described in chapter four. The general opinion of managers spoken to from the other supplier groups, is that a photograph of the account holder on a card is dated technology, 'PIN and photocards are a dead-end technology' [McCorquodale], especially as a photograph can be stored on a smart card.

There is no doubt though that

'photographs provide us with a short-term answer until the banks decide what to do next. Eventually Smart cards will be introduced nationally, during this decade' [Fortronic].

De La Rue Card Technology have considerable experience in this field and suggest that

'there is no business case for photo [ID bank] cards, and system costs to introduce it are still high, in relation to smart cards'.

Overall, suppliers believe that photographs are a short term solution to help reduce bank card fraud.

There is a strong sense among suppliers that smart card technology will probably be adopted nationally in the UK during the next 3-4 years. The concept of smart cards as electronic purses is fast gaining ground in many parts of the world with national schemes being piloting in several countries. As at June 1994, these include Australia, Denmark, Portugal, South Africa, Sweden, Switzerland, Taiwan and the USA (Electronic purse schemes in the EU are summarized in chapter nine).

## **5.7 Collaboration Among Suppliers**

There is greater interaction between all three groups of technology manufacturers/suppliers as they realise that technology collaboration is important, at least during the early stages of change, if only to agree on hardware and software standards for the industry to follow. The process of competition may become more important as each specialist supplier attempts to gain market share of a growing market.

The Smart Card Club has had a profound effect on card technology developments in the United Kingdom. The club was formed in January 1993 and by early 1994 had over 50 members. Richard Poynder, the club's chairman explained that it

'has grown to become Britain's premier forum for education and exploitation of this exciting new technology. It allows you to meet leading suppliers AND users on a regular and informal basis and learn of the latest standards and trends in the finance and retail markets'.

During my visits to club meetings, it was interesting to experience the enthusiastic method with which the larger suppliers would promote their technology to everyone present, without in fact giving too much detailed information away. Each trying to set a standard, and trying to obtain support from their competitors to approve their proposals for future bank card technology in the United Kingdom. The Smart Card Club is considered in more detail in chapter nine.

## **5.8 Bank Card Industry Standards**

The subject of card technology standards is very significant throughout this thesis. All three groups of technology suppliers confirmed that 'APACS has the last word in bank card standards' [McCorquodale]. Surprisingly, a relatively high number [40%] of the suppliers contacted were suggesting that government approval should be required for a new bank card technology. It is perceived and is probably true that obtaining government approval for a national project in the United Kingdom, involves a greater amount of development time, bureaucracy and cost. One supplier suggested that government intervention is necessary 'to reduce the chances of one or two large companies monopolizing the market'. Anyway, retail banking in the UK has such a large infrastructure that major changes need to be endorsed at government level before a successful introduction can be achieved. 'France and Germany have already enjoyed greater state support for new [banking] technologies and are more centrally planned' [De La Rue].

## **5.9 Bank Cards and the European Union**

There were few, but strong views about activities in other countries and whether we are a leading nation. Only three companies overall believe that we learn from our European partners. One supplier suggested that 'the UK has no long term strategy or planning and we have failed to learn from our European partners'. It is evident that 'we are cautious, but also very poor at collaborating with our competitors to agree a global solution'. This view was echoed by five other manufacturers.

One frustration with the industry is that the banks do not know who their customer is. Are they targetting just the local UK retail banking market or are they prepared to reach futher into the EU - this has important implications on technology standards, with research in other countries becoming part of the equation.



## 5.10 What Do The Technology Suppliers Believe The Market Wants?

What do technology suppliers believe the market wants? Figure 5.4 places these in order, showing a relatively strong agreement between the different supplier groups.

**Figure 5.4 What Do The Technology Suppliers Believe The Market Wants?**

	Type of Manufacturer		
	EFTPoS	ATM	CARD
Protection against fraudulent use	1	1	1
Low cost of card technology	3	3	2
Low cost of upgrading EFTPoS/ATM	2	2	3
Durability of card technology	4	4	4
Expected life of technology	5	5	6
Method of issuing card	6	6	5
Availability of secondary services	7	7	7

Most Important - '1'      Least Important - '7'

Source:      G Boxall, Open University

The technology suppliers believe that the primary aim for introducing a new bank card technology is to reduce card fraud and regain customer confidence in the automated payments network. The financial institutions need to review their systems to ensure that card fraud is reduced or at least 'held' at acceptable levels. It is the technology suppliers, in their own long term interest, who must ensure that any technology introduced can meet the requirements of the market. This technology must also be considered for long term adoption - the magnetic stripe bank card has enjoyed a product life of over twenty five years. Whilst the technology suppliers insist that the banks and building societies should be responsible for funding a technology change, they do admit quite openly that 'the consumer always pays - eventually!' [De La Rue Card Technology]. The facility to add secondary services to a smart card, one of the technologies most talked about advantages during the late 1980s, is not promoted quite so much by the card manufacturers. The Smart Card Club confirmed that

'significantly, we see little evidence of multiple function cards emerging; several claim electronic purse functionality in addition to core activities, but we are quite certain that their purses would not be defined as cash by the Bank of England'.

All three groups of manufacturers consider that they are already investing in new technologies and innovations, many of which are developed at a high cost, offered to the market and rejected for further development. It is suggested that maybe

'two or more technologies may be adopted over the next five years. The bank/s who make the first move has much to gain...or loose!' [NBS].

The technology suppliers contacted for this survey obviously have strong views which are very much in agreement. To put these views into context, we need to approach the market, which includes the consumer, retailers and banking organisations. Before considering the first of these, a summary of the observations made in this chapter is provided.

According to the technology suppliers, bank card technology is very much governed by APACS, although the two international organisations, VISA and Mastercard tend to initiate new innovations in this sector. Competition AND Collaboration are both key processes which the majority of manufacturers use as part of their marketing strategy. Smart Card technology is considered to be the 'future' for debit and credit cards in the retail banking sector, although fraud is not the main reason - it is difficult to define what exactly is the main driver. The bank card fraud problem is directly related to the hype of the late 1980s and should continue to be the responsibility of the banks. The technology solution is there, although the banks have little 'comfort' about the future. De-regulation has also resulted in greater competition between the banks. In certain areas, innovation has moved forward quickly. In the case of bank card technology, the process of innovation has been slow because of the absence of finite technology and data processing standards. But most clearly, the work of EMV as a joint consortium is paramount to the future of bank card technology in the UK.

## Chapter 6

### The Consumers Perspective

The Oxford English Dictionary describes a consumer as 'a person who purchases goods and services for his own personal needs'. At the other end of the linear innovation model to the technology provider, successful innovation depends on direct or indirect consumer feed-back to the technology innovators. It is too easy to believe that the consumer is led on by the clearing banks and building societies, and that they believe without question whatever the large financial organisations tell them. This is clearly not the case. Increasingly, consumers have two commonly recurring questions. Who benefits? Who pays? During this chapter, we will consider the interests of the consumer. The observations discussed are as a result of a consumer survey carried out in August 1993, together with relevant published data.

#### 6.1 Payment Methods at the Point of Sale

Payment methods at the retail point of sale were described in Chapter one. Let us first summarize the different forms of PoS payment that may be made. Ever since the early 1960s when the plastic card was first introduced as a means for cashless payment, the banks, and more recently the building societies have been introducing new financial services. By the end of the 1980s, one single bank card could be used at a cashpoint or ATM, as a cheque guarantee card, credit card and debit card. The debit card is generally regarded as the only direct method of cashless payment where the withdrawal is made direct from the consumers current account. By this recognition, the majority of debit card payment systems are 'on-line' to the banking network, through the use of down loaded hot-lists. A transaction is completed only after the system has checked the details of the presented card against this hot-list. The transaction is sent by the use of a modem, for reconciliation at the end of each trading day. Payment by cheque or credit card provides the account holder with a period of time during which funds may be made available; this may be extended by using the available interest free credit facilities on a credit card or by forward dating a cheque payment.

## **6.2 Consumer Research**

During the planning stages of my thesis, the basis for carrying out a consumer survey of debit card users was discussed and ideas developed. The objective of the survey would be to evaluate the use of plastic cards (debit and credit) as a means for payment for groceries, and to highlight the advantages and disadvantages as recognised by the consumer. This survey would then be extended to obtain views on one of the alternative technologies to the magnetic stripe card. The smart card was selected for two reasons.

1. The technology suppliers views on the potential application of the smart card in retail banking.
2. Smart cards have been universally adopted for retail banking in many other European countries and the increasing evidence that it is now top of the agenda for the UK retail banking sector.

The purpose of the consumer survey was two-fold. First, to obtain information and views of a group of consumers. Second, to use as a basis for discussion of consumer concerns with a group of key personnel in the banking and retail sector (chapters seven and eight).

### **6.2.1 Selecting a Sample**

In order to keep the survey to a manageable size using the available resources, our sample frame needed careful consideration and planning. It would be advantageous for the sample to represent the opinions of the population of the UK without becoming too selective geographically. The sample would contain consumers of different ages, professions and interests. There are logistical reasons why a national survey could not be carried out for this study. A number of practical problems are recognised, as follows.

Consider a selection of 'random' sampling procedures which are in common use for consumer-marketing. One common procedure is to question consumers as they are leaving a high-street store. There are some inaccuracies with this method of data collection. The consumer who visits this store is likely to consist of a particular class of people, who may not be prepared to devote a few minutes of their time to a survey, through which they have no personal gain. They may take an immediate negative or positive attitude towards the interviewers and provide misleading or false answers to the questions asked. Often, a free gift is offered to participating consumers once the survey is completed - this in itself can result in favouritism towards particular questions as a form of gratitude. Subconsciously,

the interviewer is likely to discriminate between shoppers. Depending upon the interviewer's own personal culture, he may reject or accept potential members of our sample frame by the visual personality alone. This would in a sense, be a subconscious selection process which the interviewer would be unable to avoid. So how can we avoid these pitfalls?

A common marketing procedure used to overcome the above problems is 'Simple Random Sampling'. Having obtained a selective or non-selective list of UK residents from the electoral register, each member is given a number and a sample chosen using a random number generator. Although the theory of simple random sampling is easy to understand, the process can be very laborious and is dependent on the make-up of the initial sample frame - in theory, for this study it should be the complete population of the UK!

The most important implication about sampling is 'the manner in which the sample is drawn determines to what extent we can generalize from the findings'. In trying to assess the consumers attitude towards the use of payment cards and EFTPoS, a carefully drawn sample not only makes the task possible, it may produce more accurate conclusions.

Various consumer surveys have been carried out on the subject of bank cards by the 'The Consumers Association' and some of their observations will be used in my later discussions. Each sample frame usually consists of between 2,000 and 3,000 members chosen at random by a computer from their total membership of about 950,000 members of the general public. Each survey is carried out on a postal basis with a relatively high response rate [58-65%]. The time frame is important and should be as short as possible in order to avoid any market changes that may affect results half way through the sampling process. Typically for a study of consumer attitudes towards banking, 1-2 months should be acceptable as long as a major event does not take place eg. national publicity about card fraud or a totally new technology being introduced.

### **6.2.2 The Questionnaire**

The Open University student database provided the sample frame for the present research. This consisted of students on the T102 technology foundation course. The qualifying factors supporting this group of part-time students were as follows.

1. The students are part-time and are employed in a variety of professions. Some have partners and/or children.
2. The students home addresses provide a good geographic spread throughout the UK, from all thirteen regions of the Open University network.
3. There is a good spread of age and gender
4. Every student has some interest in information technology. Whilst this is not representative of the UK population as a whole, we could expect this sample to be 'better informed' and to perhaps have stronger negative or positive views on retail banking technology, depending on their own personal experiences. Each member of the sample frame is of a higher educational standard, social and possibly economic background than the average person in the United Kingdom.
5. The sample frame consists of an up-to-date list of names and addresses, for easy reference.

We may need to examine the social background of our sample ; with particular reference to their occupational skills, income and home address in the UK. It is usual to ask classifying questions at the beginning of almost any survey, in case we need to see if people of different backgrounds have different opinions or experiences.

We may find an overall positive or negative response to certain questions depending on whether or not our respondents have a sympathetic attitude towards the sponsor - The Open University and myself as a part-time postgraduate student. In order to minimize biasing and ambiguity, questions should be kept as short as possible, so that questions are answered relatively quickly. This is particularly important with respect to my chosen sample and their background. How big should the sample be? The majority of survey samples involve small fractions of the population. In these situations, small increments in the fraction of the population included in the sample will have little effect on the ability of a researcher to draw certain conclusions about the population. Typically, a sample of 300 people can describe a population of 3,000 or 30,000 people with virtually the same degree of accuracy, assuming all aspects of the survey design remain the same. Betty Swift of the Open University's Institute of Educational Research Unit, provided advice on sampling and questionnaire design and layout during the earlier stages of the survey. Later advice focused on data analysis using spreadsheet statistics.

When determining the optimum sample size, there are several basic issues which always apply.

1. If statistical analysis is going to be used in evaluating and interpreting the data, then there are usually mathematical requirements which confirm the optimum, minimum and sample size.
2. A larger sample is likely to provide more reliable observations and conclusions. A statistical table may be used to select the ideal sample size.
3. The more questions asked, the greater the detail of the analysis of the collected data and the larger our sample.

Over a period of six months, my questionnaire was developed to ensure that each question was relevant. The 'Likert Scale' was adopted for many of the questions. The respondent is presented with a statement and asked to 'agree' or 'disagree' by a certain amount.

The chosen 'market-place' was the purchase of household groceries. It is a frequent purchase which is made by at least one member of every household and includes fresh and frozen prepackaged produce, including fruit, vegetables, meat and fish. Most grocery stores, including supermarkets and small corner shops, accept all forms of payment, although supermarkets are more likely to accept EFT transactions. The questionnaire was tested on 45 colleagues at the Open University, friends and relatives resulting in the final version, see Appendix I.

During August - September 1993, the postal survey was completed. The questionnaire was sent to 5,106 students on the Open University T102 course. 1,017 students responded, the data being entered into a Supercalc spreadsheet. The last part of this chapter considers the observations made as a direct result of this survey, which are relevant to my earlier discussions.

### **6.2.3 Data Qualification**

Initially we must first qualify the data collected. The population gender was proportionally divided [51% male / 49%female] with the majority of respondents living in the north [33%] and south [55%] of England. The average gross income copied the UKs normal distribution curve of those in employment, with the majority of respondents earning £15,001 to £30,000 [54%], probably the most relevant group in this thesis. The results show the spread of occupations with a relatively small number working in technical

management The age spread shows that a large majority of the sample are of working age ie. 21 to 60 years [94%]. This is not representative of the country at the time of carrying out the survey, when approximately 45.3% [26,177,000 people] of the UK population were working either full-time or part-time (more than 16 hours per week). This is based on data provided by the Central Statistical Office in London. The advantage of this sample is that they are potentially more likely to use electronic payment systems. Around 6% of the sample were unemployed, considerably less than the actual 8.9% rate of unemployment in the UK at the time of carrying out the survey. According to Lehman Brothers (1992), the leading four supermarket groups have a market share of 27.5% - figure 6.1.

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**Figure 6.1 Market Share of the four largest supermarkets in the United Kingdom.**

<b>Supermarket Group</b>	<b>Sales Turnover (Exclusive of VAT)</b>	<b>Market Share (In the UK)</b>
Sainsbury plc	£ 6.6 Billion	9.7%
Tesco plc	£ 6.3 Billion	9.4%
Safeway plc	£ 3.3 Billion	4.9%
Asda plc	£ 2.9 Billion	3.5%

**Source: Lehman Brothers (1992)**

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The market position of each of these supermarkets agrees with the place of purchase in the survey results, although a relatively high 74% of the Open University sample choose to purchase their groceries from these major four groups. There is one favoured explanation for this discrepancy - convenience. 94% of the sample are employed and the majority fall into the A,B,C1 social bands. They are thus likely to have more disposable income and a busy schedule, and consider convenience as a key factor when choosing where to buy groceries. Whilst they could be paying relatively more for the average 'shopping basket' of groceries, it is easier to visit one store on a less frequent basis. In our sample, 64.3% of the supermarket shoppers visit their store weekly and 23.6% less frequently. One of the objectives of this survey at the beginning was NOT to identify consumers main concerns when choosing a supermarket. An important contribution to this issue was made



by Lehman Brothers International who carried out a 'shoppers concern survey' in 1990 and 1992 (see figure 6.2). The reader can make some own conclusions from this table - note that on both occasions, a fast checkout is feature two in the list, referring to both the totalling of groceries purchased and the payment method. This indicates good support for debit cards.

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**Figure 6.2 Shoppers Concern Survey 1990 and 1992**

<b>Importance</b>	<b>1990 Shoppers Concern Survey</b>	<b>1992 Shoppers Concern Survey</b>
1st	Friendly staff	Friendly staff
2nd	Fast checkout	Fast checkout
3rd	Product range	Low prices
4th	Product layout	Product range
5th	Low prices	Product layout

**Source: Lehman Brothers (1990) / Lehman Brothers (1992)**

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#### **6.2.4 Observations From Present Survey**

Whilst only the key issues are discussed in this chapter, there are many other interesting observations made as a result of the consumer survey, which are not directly involved with the core subject of this thesis. A large number of the sample purchase their groceries from national supermarket chains [88%]. These stores offers a variety of payment methods with almost every store accepting EFT transactions, including credit and debit cards. A surprisingly large number pay for their groceries using either a credit or debit card [50%] which would indicate that this sample has a particular interest in using the available technology - APACS own research suggests that at the time this survey was carried out, only 6% of payments in the supermarket are made by credit or debit card. Consumers provided many primary reasons for using plastic cards, although there were only three which were clearly significant (see figure 6.3).

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**Figure 6.3 Why do consumers use Debit Cards at the EFTPoS?**

The transaction is faster	54.5%
There is no need to carry cash	21.4%
There is no need to carry a cheque book	14.3%
Other Suggestions	9.9%

Other suggestions included 'recommended by my bank' and 'no reason provided'

Source: G Boxall, Open University

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Over 47% of the sample believe that they will use debit cards more often in future - particularly the professional and management A, B social groups. This suggests, in agreement with forecasts by APACS and the British Bankers Association that the use of plastic cards, in particular debit cards, will dramatically increase during the next decade. During the three year period up to December 1993, the number of debit card transactions increased from 192 million to 659 million, BBA (1994). Along with this increase in use, will be a possible increase in card fraud. During the three year period up to December 1993, the level of plastic card fraud increased from £122.5 Million to £129.8 Million, BBA (1994). This consisted of large increases for the first two years, followed by a fall during 1993 and confirms the industries action to try to control card fraud. The remaining 50% of the sample who do not pay using a plastic card, use either cash or cheques. It is interesting to confirm that the overall majority of the sample appreciates what a debit card is. Over 91% could confirm whether they have a debit card in their purse or wallet. So why are they not being used?

In chapter five, evidence was presented to suggest that the technology suppliers are committed to the idea that consumers have a considerable concern for bank card fraud and this is the fundamental reason for selecting an alternative bank card technology. When the question of fraud is proposed directly, 50% confirmed that it is a concern and a reason for not using debits cards. However, when the consumer is offered a list of possible reasons for not using debit cards, fraud is not given primary importance. The reasons given suggest that at the EFTPoS terminal, the decision of which method of payment to use is guided by more 'pending' matters such as, bank account balance and concern to keep spending under

tight control. The concerns given, which help to explain why debit cards are not used by certain individuals, are listed in figure 6.4.

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**Figure 6.4 Why do you NOT use Debit Cards at the EFTPoS?**

The transaction results in an immediate debit from by bank account....	37.2%
It is difficult to keep track of my spending.....	32.0%
The possibility of an <u>error</u> at the EFTPoS....	10.2%
The possibility of card fraud....	6.0%
Other suggestions.....	14.6%

**Source: G Boxall, Open University**

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The appears to be a strong misconception that debit card transactions are applied to the card holders account as soon as the transaction at the EFTPoS has been completed. It does in fact take 3-4 days for the transaction to clear, similar to a cheque. This suggests that the banks and building societies could perhaps market debit cards by emphasising that the clearing process takes just as long as for paper payments.

The 'market' components within the reverse product cycle are the consumers and the banks. The picture so far would suggest that the consumer is quite satisfied with existing bank card technology. Also, we should note that only 3.7% of the complete sample are not satisfied with the range of services available at their own branch. There are concerns, but these would NOT necessarily be overcome by changing to an alternative technology. The possibility of error at the EFTPoS indicates that more and better staff training is required at some supermarkets, or the work pattern should be modified to avoid long periods of repetitive tasks.

Two respondents confirmed similar experiences, as follows. The first individual is a 40 year old female Medical Secretary living in Dorset who explains that

I once wrote out a cheque to Safeway which was returned to me several days later. I had actually been in Asda and the cashier had not noticed my mistake. So how careful can checkout staff be with several hundred boring transactions every day'.

In fact this respondent does not indicate any strong support for debit or credit cards and was not particularly interested in the advantages of the smart card. The second individual is a 44 year old unemployed male living in Lancashire who described how

'18 months ago, I made a Barclays Connect transaction on my wife's card without being aware! I used the card at a C&A [location identified] store. The card was clearly made out in the name of Mrs xxxxxx and showed my wife's signature on the back, which is totally different to my own. The first we knew of this is when my wife received a letter from the bank stating that her current account was overdrawn'.

These two instances confirm how errors at the POS can occur with no intention of fraud. The Consumer Association carried out a written survey to 3,623 people during June 1993. This confirmed that 17% of this sample had experienced errors on their account during the previous year - unfortunately, it is not known how many of these related to the use of debit cards, but it is believed that the figure is relatively high. A number of respondents suggest their surprise at how quickly checkout staff make the comparison between card and voucher signatures - sometimes not checking at all. One respondent who clearly wanted to remain anonymous suggested that

'PIN validation of cards would remove a lot of point of sale fraud. I do not use debit cards because of my distrust of the SWITCH system. My fiancé used to work at a bank and has told me of the problems related to debit cards. Human error is a problem and computer operators are usually at fault!'

The survey results suggest that administration errors are more likely to occur, rather than fraudulent transactions and that the systems in place are quite acceptable. One individual male who is 21 years old and is employed in the services explains that

'once the bank incorrectly debited my account with another persons payment. How such mistakes occur amazes me, but as long as they are rectified quickly.....!'

I would suggest that the fundamental long term concern is consumer confidence. Whilst the subject of bank card fraud receives insignificant media coverage, the general public continue to support the use of plastic cards for a variety of reasons already mentioned. Particularly in retail banking, innovation must ensure that consumer confidence remains steady without introducing too many changes, too quickly. Later in the thesis, I develop further the concept of consumer vs. technology push. Banks should accept more responsibility for the losses encountered through fraud, suggested 63% of my sample, whilst 21% of this sample suggest that the consumer should be more responsible.

By making cash more readily available, as I suggested earlier in chapter one, the banks are actively perpetuating its use. They are also keeping the customer outside the branch, away from other potential types of business, such as mortgage, insurance or savings. Over 62% of my sample use a cash dispenser at least once every week. More often people in the northern part of the country, and predominantly non-workers, or workers in the skilled trades, manual jobs or clerical and office staff. There are a few suggestions as to why the cash dispenser is so popular. Cash is physical and you either have it or you don't. It is not dependent on the vagaries of the on-line network, computer systems or card technology whether magnetic stripe or smart card. It enforces the important discipline of careful budgeting and rarely embarrasses the owner. If it has been acquired by dubious means or spent on dubious pleasures, it can be 'trusted' as there is no audit trail.

Despite the increasing publicity about 'phantom withdrawals' from cash dispensers, the consumer still uses one in preference to paying at the EFTPoS with a credit or debit card. Over one third [36%] of the complaints that warranted a thorough investigation by the Banking Ombudsman concerned ATMs in the year to September 1992. In the Year to September 1993, this figure had dropped to 20%, although this does not necessarily mean that the number of phantom withdrawals are reducing. The banks may be settling the disputes themselves to avoid bad publicity? There is little doubt that many failures are due to a mechanical failure in the machine to count the correct number of bank notes. It is also reasonable to assume that card skimming or copying with the genuine card holders knowledge and involvement in the fraudulent withdrawal of cash, whilst denying all knowledge of the transaction, also take place. Many cases in which it is bank employees who are involved with fraudulent withdrawals are kept quiet, since the banks do not want examples of theft by bank employees undermining public confidence.

How many of the consumers in this sample had actually experienced unauthorised payments or cash withdrawals? Of the debit card users, 5.4%, and of the debit card non-users, 8.1%. I have tried to discover from the banks whether these figures are relatively high, low or about average - for obvious reasons, only limited data could be found.

In a survey carried by ICL in 1993, it was found that

'about a quarter of people do not feel safe withdrawing money from an ATM - 33% of women and 30% of the over 45s. The majority (92%) say they have never been dispensed the wrong amount by an ATM against 2% who have received too much. Less than two thirds (59%) would tell the bank if they received too much'.

Over 39% of the overall sample use credit cards to pay for car fuel (diesel and petrol), which is considerably higher than the 18% who use credit cards for groceries. Bearing in mind that over 60% of new cars sold in the UK are company cars, I believe that this 39% reflects the high number of employees who pay for car fuel using a private or corporate credit card, to then claim the cost back as a business expense at a later date.

Surveyed consumers have two general areas of concern with their own bank or building society. The first is that banks and building societies do not keep their customers updated with details of new accounts or banking services - we have seen strong evidence of this fact with the introduction of interest bearing current accounts, aimed at gaining new customers without being promoted to existing and established customers. 40% of the sample considered this to be one failing of their own branches. Secondly, bank charges is a sensitive subject, with 33.8% of the sample considering their own bank charges to be excessive and only 7.3% prepared to pay higher bank charges for a new bank card technology which could offer extra benefits to the card holder.

In the second part of my survey, a possible scenario was proposed. This passage of text describes the introduction of a new bank card technology, see appendix I. What proportion of the sample could understand the situation described? This direct question was asked and was understood by 99.2% of the sample, perhaps as expected. There appeared to be no pattern in terms of make-up, geographical, sex, occupation or banking preferences of the 0.8% of the sample who did not understand the situation described.

The proposal that a financial database could be put on a bank card resulted in a very positive response. 81% of the sample believed the idea to be useful, to some degree, as an audit trail. We could question whether this positive response is representative of the UK population as a whole? It might depend on how the database data is used and who has access to it. Would those suspected of a criminal or civil offence have to allow the authorities access as a matter of law? MPs and civil liberties groups might strongly argue against the idea, suggesting that the scheme is a back door method for introducing a national ID card. As the General Secretary of Liberty suggests, 'the more information a card carries, the more likely it is to be used as an identity card'. Liberty believes that current data protection legislation is inadequate and does not protect people's privacy.

Supermarketing Technology (1994, p20) suggests that

'retailers have been lukewarm about the idea as possibly increasing complexity and extra resource costs at the POS. Against that, however, there is seen to be an increasing need for retailers to have some form of identification before sanctioning sales over cheque card limits, as a means of countering problems over dishonoured cheques and debit card transactions'.

Bank cards are currently either free of charge or carry a nominal annual charge of between £12 to £20. Bearing in mind that a new multi-function card could provide the account holder with more facilities and greater security against fraud, how much is the consumer willing to pay as an annual fee? Figure 6.5.

**Figure 6.5** How much would you be prepared to pay as an annual fee for a 'smart' bank card which offers you extra facilities or security.

	Maximum	£0	£15	£20	£25	£30	£More
Facilities (% of sample)		59%	23%	9%	6%	2%	1%
Security (% of sample)		57%	24%	9%	7%	2%	1%

**Source:** G Boxall, Open University

Even within this sample of consumers who have a strong perspective of technological progress, the annual charge could not be increased too much without complaint, with 59% agreeing that banking facilities should be free of charge to keep them as a customer. This result is perhaps expected, whilst unrealistic. Only 7.2% no longer use credit cards because

of increasing bank charges. According to the consumer, who should take the most responsibility for protecting a bank account against fraud?

Most Responsibility	The Bank or Building Society The Consumer or Card Holder
Least Responsibility	The Retailer

A frequent suggestion throughout the survey was that 'a means of reducing card fraud would be for people to collect cards from the issuing branch?' This idea has been proposed by different organisations (APACS, Government, The Post Office, Working Parties) for many years, with only a small handful of banks actually taking up the idea nationally. Why do consumers not have to collect their bank cards from the issuing branch or could the banks use recorded delivery to send cards and PINs to customers who do not live in the same locality? This is a question which is later offered to the financial organisations.

A majority (86%) of the sample agreed to having photographs on bank cards with only 4% strongly disagreeing to the idea. As we found in chapter five, this proposal is acceptable to the technology suppliers but dated and not considered as progress.

In April 1994, Teletext asked its viewers if they supported the idea of having their photograph on their driving licences - 92% of the 2,876 respondents said yes. It is possible for a similar or higher proportional of the same sample to say yes to having photographs on bank cards. One concern however is that the photograph is likely to be composed by electronic digital means, rather than physical photographs etched or printed on to the card base. This could allow them to be stored on computer and transmitted electronically.

In summing up this chapter, there is little doubt that debit and credit cards will continue to be used more frequently, especially as the availability of EFTPoS terminals within smaller retailers improves. However, the consumer is not prepared to pay considerably higher increases in annual fees to assist in technological advancement - this responsibility being that of the banks.



During the early 1990s, banks profits continued to increase and as one consumer suggests

'maybe the technological advances that have been made should free bank personnel to increase and improve communications with customers - rather than increase staff reductions?'

There is evidence that some changes are happening with the banks opening up their banking halls to the consumer, although staff reductions continue, as technology or perhaps the share-holders take precedence? There is also strong evidence to suggest that the consumers of the 1990s believe they have limited influence on the developments carried out by the financial organisations, even though financial services companies only make changes, after carrying out some consumer research first. The question arises: How effective or accurate is the consumer research? VISA admits that their decision making is based on 'their own consumer research, although no individual consumers will directly represent the general public on any of their working committees'.

### **6.3 Are Consumers Ready For Electronic Cash?**

To summarise this chapter: Probably not! With increasing competition between the banking organisations, consumers will quite happily change bank to obtain the best terms overall. If a bank or building society chooses to introduce a new card technology first and charge the consumer, it potentially has a lot to gain or lose in the process. Consumers may choose to vote with their feet as they move backwards and forwards across the high street.

'What's in it for me?' probably describes the typical attitude by the consumer. The consumer requires some compensating advantages for changing to a new method of payment, perhaps ultimately lower bank charges, a more comprehensive and convenient service. The consumer will not accept that reduction of bank card fraud is their responsibility. The majority by far see it as the responsibility of the financial organisations.

Marti & Zeilinger (1982) summarize the position by suggesting that

'In principle, the ultimate purpose of bankers and retailers is to provide services that meet the needs of consumers. However, it does not necessarily follow that changes in payments systems that seem to meet the needs of bankers and retailers will inevitably be equally beneficial to consumers'.

## Chapter 7

### The Banking Organisations

As described in chapter one, the United Kingdom has one of the most centralised banking systems in the World, with the largest four clearing banks (Midland Bank, National Westminster, Lloyds, and Barclays) having issued over 45% of the bank cards being used in the UK. As a distinct comparison, in the USA there are over 12,000 different banking organisations with the average bank having only four branches. However, de-regulation has changed the UK retail banking system considerably during the last 10-15 years, with more competition between individual financial organisations and alternative providers entering the market. The banking industry in the UK has experienced increasing competition from other financial groups, such as the building societies, insurance companies, consumer credit organisations and foreign banks, providing services either remotely or investing directly in the UK. There has also been a substantial growth in the remote or telephone banking market which introduces additional security difficulties and reduces the level of direct contact with the customer. Hence, there are more organisations competing within a limited size market.

Conversely, during the first half of the 1990's there has been an increasing number of mergers, reducing the number of 'players' competing, hence providing a greater market share for a smaller number of larger organisations. This in turn has led to increasing competitive pressures on the UK banks resulting in staffing levels being reduced, more technology being introduced and the range of financial products being increased and long term customer loyalty become a key issue.

Whilst competition is the main technology driver for the banks and building societies, reducing bank card fraud is an important issue which urgently needs addressing. Bank card fraud is a concern highlighted by all the banks with 'limited time before the major fraudsters strike and publicly humiliate the banking fraternity'. All banking groups in this chapter confirm that fraud is a growing problem in the UK - although perhaps more political than actual. The amount lost to fraud in the UK has fallen each year since 1992 and at levels of around £150 million in total, is judged by the industry as insignificant - although

a public statement to this effect would never be made. New bank card technologies are being evaluated by every organisation within this sector and the technology push Vs. market pull equilibrium is moving in both directions. The debates over technology standards, who benefits if smart cards are nationally introduced, and who will bear the costs of a technology change, seem reminiscent of the EFTPoS'UK scenario of the 1980s. Major issues of compatibility remain, both nationally and internationally.

In this chapter, the main groups of banks and other financial organisations are considered. More than twenty telephone and face-to-face interviews were carried out during late 1994 and 1995, with senior members of staff who work in bank card planning strategy. Due to the sensitive nature of these discussions, tape recording was not permitted by any of the interviewees and reference to particular individuals was refused by most organisations.

## **7.1 UK and International Banking Groups**

Figure 7.1 identifies the banking groups which are considered to be influential in the UK bank card technology industry.

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**Figure 7.1 Banking Organisations in the UK.**

The 'EMV' group made up of	Europay International Mastercard VISA International
American Express	
Diners Club	
APACS, including the major clearing banks	
The Building Societies	

**Source: G Boxall, Open University**

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Each of these organisations are considered in this chapter, focusing on the technical merits of various card innovations proposed by each group. A variety of options are being considered including the national implementation of smart cards, with a variety of driving

and constraining influences affecting the speed of innovation. What are the main issues influencing new bank card technology in the UK? The interviews with managers from these banking groups were undertaken with knowledge of the following possibilities.

1. The need to keep bank card fraud under control, with specific concern of counterfeit fraud.
2. The pressure to introduce new services and promote customer loyalty in a changing and competitive market.
3. The kudos, and financial profit, that could result from being 'first' with a significant card-based innovation, both in the UK and internationally.
4. The possibility that the Mondex and other significant trials, in true Reverse Product Cycle fashion, lead to more radical innovations as the industry identifies new consumer needs.
5. The need to develop a national standard, agreed by all agencies within the adopting industry.
6. Activities in other countries in relation to an international cross-border retail payment system.

#### **7.1.1 Europay International, Mastercard and VISA International (EMV).**

EMV is the abbreviation given to the collaboration of these organisations, which agreed in 1992 to prepare common standards for the implementation of smart cards for retail banking. In a public statement made by the President and CEO of Mastercard, Eugene Lockhart, the medium term aim is to add value to payment products as well as to reduce the losses due to fraud. Mastercard has set a seven year plan which started in 1992, with a target of cumulative savings of over US\$ 3 billion from reduced fraud and lower transaction processing costs across the world. At what cost? This information is not in the public domain! A number of requirements led Mastercard into this arena, with the ultimate target of winning the majority share of the business.

The importance of international standards was indicated in chapter three. The Mastercard approach is established around two main elements. First there is the joint effort with Visa International and Europay International to develop common ISO compatible standards for

payment cards in Europe. EMV (1995) released these new smart card standards during late 1995, making them freely available to all qualified organisations who have some activity within the adopting industry. Allowing for improvements, EMV confirm that they are likely to be updated before June 1996. Next, Mastercard is developing its own global rules for the issuing and acceptance of smart card based systems. These rules define how PINs can be used at the EFTPoS and in ATMs, and the encryption processes to be used within the payment terminals. This includes consultation with technology suppliers, member banks and retailers, although Mastercard admit that in their own view, the consumer has limited direct influence on the procedures adopted. Mastercard have both a credit card (Access in the UK) and debit card (Maestro) which, as a joint venture with Eurocard, was launched in 1992. At that time, Richard Phillimore, head of card strategy at Eurocheque International, now Europay International suggested that

'Mastercard had also been investigating the debit card market and was attracted by the opportunity of developing a global brand. Here was an opportunity to combine forces and create something that would be bigger than Europe and had the potential to be world-wide.....it is not a replacement strategy, but will enable banks to add value to existing products providing them with new revenue opportunities. You cannot ask the member banks to throw away all the investment they have made in their existing debit card schemes.....it will be up to the individual banks to decide what to do'.

This is certainly the case as we move towards the next decade. Whichever bank card technology is adopted, and Mastercard believe without a doubt that smart card is the only option, it must interface simply and cheaply with existing technology.

Mastercard has experienced tremendous growth in the Asia Pacific region and this is its area of greatest concern for counterfeit bank card fraud. Whilst much of Mastercard's bank card developments are for the EU market, a global view is also taken. According to one senior representative in the USA, Hong Kong is one of the main countries where counterfeit cards are manufactured. These cards were previously used almost exclusively in Hong Kong and to a lesser extent in Singapore, Thailand and Malaysia. This activity is now migrating to the EU and the USA where the use of counterfeit cards is increasing, particularly retailer collusive fraud involving retailers of East Asian origin. The majority of card frauds are perpetrated in a country different to that in which the card was issued. For example, whilst travelling abroad, details of a particular bank card are obtained by a third party without the bank or actual card holder knowing. This card number is then copied on to a counterfeit

card which is used before the next bank statement reaches the account holder. In the short term, Mastercard have created operational auditing teams who are working very closely with their member banks. The card holder's normal transaction activity patterns are observed and any irregularities are noted as soon as possible. As far as Mastercard are concerned, smart card technology would be used to increase the inherent security features of a bank card as well as providing additional multifunction services in the longer term. Mastercard will most probably look for third parties to form partnerships.

What is the view of VISA International? All VISA card development strategy for Central and Eastern Europe, Middle East and Africa (known as the CEMEA region) is handled by VISA International in Kensington High Street, London. Support and guidance is provided by VISA in California, USA. Interviews with two senior managers from VISA International in London, suggest that VISA are taking a very similar approach to that of Mastercard, as one of the EMV group of standard setting organisations and remotely as a competing organisation. The most important observations, according to one manager, suggests that

'the most important stage in making a totally global system is the preparation of open standards that can be shared among the entire banking industry. There are currently three alternatives being considered within VISA International - keep things as they are, introduce the smart card or protect the magnetic stripe with another encryption system, watermark is one example of this. We could also combine the smart card and magnetic stripe onto one card.'

The other manager suggests that

'The options are between spending more now, to get more in the longer term - the magnetic stripe will still be on for perhaps the next ten years with a merger with a second technology over a period of time - to move technology will take years'.

Watermark magnetics was tested by VISA in trials throughout parts of the USA and UK during 1992-93, and whilst the technology was seen as a secure and cost-effect alternative for the medium term, it was not considered suitable as a long term solution. This was for three reasons. First, data capacity of the existing magnetic stripe technology was limited to only 223 characters and second, smart card technology was seen as the twenty first century solution, with the cost of upgrading the entire ATM and PoS network providing something 'new' to the adopting industry.

The third and very significant issue was that the technology supply industry as a whole wanted to see something more innovative. However, the Holomagnetics and XSec technologies were rejected by VISA early on in their investigations, due to their immaturity and lack of applied experience.

It seems that the EMV consortium is considered as a necessary evil by all three competing members, although no-one would publicly admit this. They need to work together initially, if only to agree some basic standards. Once these are in place, as VISA suggests within its own annual report for June 1995, 'Let The Games Begin!' Chief Executive Office, Ed Jenson confirms that 'there is no question - the chip is coming'. In their 1994 annual report, VISA refers to EMV as the 'international bank card groups' suggesting that 'as technology pioneers all know too well, true technological innovation is a more arduous marathon than a quick sprint to the finish'. This is exactly how Kline (1989) describes the innovation process using his chain-linked model, with feedback loops allowing for change and modification.

In 1994, VISA International began signing agreements with twenty or so leading technology suppliers, all of which have been listed in figures 2.6 and 5.1 of this thesis and contacted during my research on technology suppliers, the subject of chapter five. The target for completing the necessary modifications to its 'Visanet' EFTPoS systems, for accepting the authorization and settlement of smart card transactions is set for the end of 1996. There is no mention in the public domain of what EMV will charge the consumer for the smart card payment card. Also, retailers are still waiting to hear what costs are involved. In a public statement made by William Chenevich, the Vice President of VISA in January 1995, it was confirmed that

'VISA is moving off the drawing board, with the development of prototype equipment. Our goal is to ensure a seamless introduction of this new technology, when members decide that their markets need it. In addition to payment functionality, the chip [smart card] will enable non-payment functions as well. It will serve as a vital link, building loyalty between the bank and customer. We have set the course for rational business and market driven global introduction of the technology by member banks.' [CTT,1/1995]

In his statement, Chenevich suggests that the adopting industry is responding to both a technology push and market driven solution, in that VISA are taking a leading role by

ensuring that their ATM and EFTPoS hardware is ready for the technology change as soon as it is formally requested by their member banks. This is preparing the way forward for more radical changes and services to be introduced. This again is following the principle outlined in Kline's innovation model with Barras's Reverse Product Cycle. VISA regard Mondex as a small trial which has at least advanced the whole industry to the stage where the need to introduce a new bank card technology is confirmed. Ed Jenson, CEO of VISA was probably referring to Mondex in his annual report when he spoke about 'new fragmented alliances with little hope of global service or brand recognition'. If Midland and National Westminster bank have adopted smart cards to gain the technological advantage, then the other financials need to follow with something better - with over 19,000 member banks and 350 million VISA bank cards in circulation worldwide, VISA can certainly influence the industry on their own. Within EMV, they hope to achieve even more. VISA's own electronic purse 'VISA Cash' is a competing product to Mastercard's, Europay and Mondex. Some industry managers believe that they may join together, others see the competition as becoming increasingly 'fierce'!

### **7.1.2 American Express (AMEX)**

A senior manager in card strategy at AMEX was interviewed. She was previously employed in the Mondex development team at National Westminster Bank.

American Express (or AMEX) entered the bank card market in 1963. The company was originally set up in the late 1890s, to supply Travellers Cheques for the safe-keeping of currency abroad. Following incredible growth during the 1960s and 1970s, the travellers cheque business is now relatively static and AMEX confirm that they are concentrating on their Corporate Charge Card business - bank cards held and used for business travel and expenses only. As the UK clearing banks introduced their own charge cards during the late 1980s, AMEX lost market-share in this sector. AMEX had 1.3 million card holders in 1991, 1.1 million in 1992 falling to 1.0 million in 1995, following which AMEX launched their first credit card, in an attempt to retrieve market-share from their competition. They admit that it will take maybe two years to see if this has the desired result. During 1994-95 they centralised all European credit and charge card promotion through their office in Brighton, East Sussex. Because of the increasing competition, AMEX are centralising operations into core units with each department covering specific tasks within the company.



Card development strategy is mainly handled by a dedicated team in Salt Lake City, USA. AMEX regard themselves as a 'truly global player aiming for the top 20% of households, the A,B,C1 customers' and will probably opt for smart card technology as the international alternative to magnetic stripe. In the USA, there is a lower cost and more efficient telephone network, the cost reductions of operating through this network being discounted to provide a more competitive system for the retailers. As most AMEX transaction authorizations in the UK are still off-line, AMEX will soon have to introduce more security features at the EFTPoS, initially by increasing the balance of on-line authorisations which are carried out. Bank card charges are a bone of contention for AMEX.

'...the biggest mistake the UK banks made was to give free banking to customers. All the banks want to re-introduce charges, but no one is willing to go first. The consumer will not pay extra for the product [bank card] as it is, whatever technology is used. We need added value, either through an extension of our points scheme or by introducing an electronic purse'.

During the interview with this senior executive, a clear work plan for the UK market was described. AMEX see themselves as a niche player and except for the USA, their market share in most countries is small, being only about 10% in the UK. With technology trials proliferating throughout the world, AMEX position themselves as a 'fast following observer, preparing our own technology trials and finding suitable partners for the long term future'.

How about the Mondex experiment which was described in chapter four? Apart from a few inherent mistakes, such as the lack of an audit trail in the back office and delays in supplying the technical specifications to legitimate working parties, the whole concept will attract 'interesting media coverage during the next 6-9 months'. One criticism by this Amex manager was that even with three years of planning, on the final launch date many retailers were not supplied with the correct EFTPoS hardware. Certain areas of development (like the car parking system and ATMs) were considerably behind schedule. As an ex-employee, further discussion revealed the true concerns of the Mondex team - the system specifications getting into the wrong hands, fraudsters etc., Will Mondex become the global electronic payment system of the future? No comment. Although the facial expression gave the answer - unlikely - in it's present form. AMEX are certain that despite all the recent activity in the retail banking payments sector, there is still along way to go

before we see the national implementation of anything new.

'It could prove very costly if we start launching new card related products too early. Consumers are sceptical and will take some persuasion to accept anything different to the norm'.

AMEX are collaborating with one member of the EMV group (probably Europay International) although will not confirm who this is. Similar schemes to Mondex on a smaller scale are planned, although no timescales were provided. This is a commercial secret. One problem which AMEX predicts is the

'growth in different operating standards, resulting in even more cards being carried in our wallets, as competition between the different issuers demands a larger market share for each'.

AMEX are not the only organisation concerned about this potential problem.

### **7.1.3 Diners Club International**

Diners Club International proved very difficult to contact. Aspects of card technology innovation

'are not available to the general public, and I cannot confirm whether we are considering a change to smart card technology in the foreseeable future. In fact, this is handled by our company in the states (USA).'

The only evidence is that there is very little information being received by the media. The commercial strategies of Diners Club International are being kept in-house, indicating one of two possibilities. First, they have a firm strategy which they are successfully keeping away from the competition, using their own standards with confidence. Or, they are observing from a distance before reacting to market feedback from Mondex and consumer demand. Few managers in the industry appear to know what Diners Club approach will be. This is quite surprising, bearing in mind the consultation that has taken place since EFTPOS'UK.

#### **7.1.4 APACS and the Card Payments Group**

APACS was described in Chapter one and a full list of members provided. The activities and observations of the Card Payments Group are now considered, including the activities of some of the clearing banks, concentrating more on their strategic issues. This common interest group formulates and implements policy on relevant strategic issues of card technology 'of a non-competitive nature' APACS (1994). Priority issues during 1994 were to establish the ground work for introducing smart cards into the UK retail banking industry. No reference to other card technologies was made in this report. In July 1994, The Integrated Circuit Steering Committee was formed to proceed with Phase A of the project to develop a chip card payment system in the UK.

The other main activity during the first half of the 1990s was to bring greater awareness of the activities of APACS to retailers. APACS believe this to be working. In chapter six, it was suggested that very few retailers had heard of APACS and the work carried out by APACS on behalf of their member banks. The Card Watch campaign is a pro-active attempt to change this situation and APACS claim to be talking to the retailers on a regular basis, which is one key advantage over EMV, who are not permitted to do this. Their representation in this respect is via their member banks with whom they can openly discuss the alternative technology options. APACS are particularly keen to avoid another EFTPoS'UK scene and suggest that cooperation with the retailers, particularly the larger retailers, is paramount to the success of any new card technology and payment system.

Richard Johnstone, working on bank card standards at APACS, suggests that

'EMV is the major influence on the standards being set-up in the industry. The member banks of VISA, Mastercard and APACS are all facilitators who will only go down the smart card route if there is a positive business case'.

Whilst AMEX is eager to capitalise on the additional benefits of smart cards for direct customer loyalty, APACS have a different view. Fraud reduction is the major issue which includes, as one senior manager is eager to state, 'counterfeit cards as being the potentially big problem for the whole of the banking industry'.

The secure delivery of bank cards and PINs and the introduction of cameras into ATMs are helping to reduce ATM fraud, although newer methods of cheating the banks and building societies are being sought by the fraudsters. In September 1995, two men were convicted

of defrauding more than 100 people of over £125,000 over a period of five weeks, by setting up a fake cash machine on the side of an office in London. The machine, which had a Halifax building society logo on the outside, recorded the card details and PIN as the holder tried unsuccessfully to withdraw cash. These details were then later used to 'manufacture' copy bank cards which were used to withdraw cash from bonafide ATMs. This was not the first case of this type, and the APACS are quick to play down this potential and growing problem. Figure 7.2 identifies some of the actions taken by the banks to monitor and reduce ATM fraud. One senior manager at Midland Bank suggests that

There are over 18,000 ATMs in this country. If every machine were to have a hidden camera installed, we estimate a cost of over £30 Million with no allowance for maintenance costs. There would be no advantage to the PoS terminals. We [Midland] are currently installing cameras into ATMs located within high-risk areas throughout the country.'

Phantom withdrawals are more of an embarrassment to the banks, with the resulting bad publicity demanding more and more explanation. There are also an increasing number of legal actions, following the publicised efforts of Denis Whalley, a solicitor in St.Helens, Merseyside. Whalley is trying to bring a number of phantom withdrawal test cases to court, having been incensed by the null attitude of the banking industry in responding to the problem. Reporting in a Sunday newspaper, Whalley suggests that

'as far as the banks are concerned, they [the banks] have to balance fraud with customer convenience. They seem prepared to have ten fraud cases rather than one complaint about inconvenience' [Sunday Times, 10/95].

APACS are working with VISA independently as well as the EMV group, to introduce a selection of technology trials during the second half of the 1990s'. Johnstone suggests that non-cash transaction volumes are set to grow to over 11 billion by the year 2000 - according to APACS own estimates. If this is the case, then a more secure technology is required in the long term. APACS appear convinced that smart cards can offer this, regardless of any arguments put forward. New innovations such as the electronic purse and electronic mail will alter the way individuals and companies make payments, and the rate of decline in the use of cash will be influenced by the public's acceptance or rejection of electronic money.

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**Figure 7.2 Bank Card Delivery and ATM Security in March 1995.**

<b>Bank / Building Society</b>	<b>Number of Bank Cards Issued (Approximate)</b>	<b>Secure Delivery of Cards</b>	<b>Camera built into ATMs</b>
Barclays Bank plc.,	18 Million	Secure posting or collection only	No, although pilot scheme planned
Lloyds Bank plc,	11 Million	Secure posting or collection only	All ATMs by early 1996
National Westminster Bank plc.,	10 Million	Secure posting in high-risk areas	Pilot scheme in progress
Midland Bank plc.,	9 Million	Secure posting, and collection of PIN	50% ATMs
TSB Bank plc.,	9 Million	Confidential	Confidential
Abbey National Bank plc.,	1 Million	Secure posting in high-risk areas	Confidential
Halifax Building Society	1 Million	Secure posting or collection only	Pilot scheme
Nationwide Building Society	Confidential	New accounts have to collect cards	Confidential

**Source: G.Boxall, Open University**

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A senior manager at APACS believes that

the member banks of APACS have control over when and how the new card technology will evolve and APACS is helping by encouraging more collaboration with schemes like Mondex. The work of EMV is all towards a global solution which will have to be approved by the banks.

APACS manages quite successfully to operate as a non-competing and independent organisation to the other financial organisations, communicating with everyone to develop common themes of discussion and development. Much of the UK banking infrastructure

has evolved around the operating companies within APACS and Mabbott suggests that we are now entering the 'next phase'. Another senior manager at APACS explained the following during a telephone interview.

'Banks are converting to smart card, NOT because of fraud losses. It's to protect their market and expand their revenue base. Stored value opens up new revenue streams and creates a product that other non-traditional financial competitors can't offer.....Ultimately, standards will be established so that true inter-operability will exist. The standards will be adopted - regarding how the card and reader will be secured so that different schemes will adopt the same security module. That way the cards are differentiated only by the coding in the application. I think smart cards are infinitely more secure than standard bank cards. The technology is incredibly complex to protect the bank, retailer and consumer against fraud. The smart cards that have been cracked have been phone cards that lack the security of full microprocessor cards. Hackers making that claim haven't seen the newest security schemes.

Competition, again, is the key issue. The banks need to find other ways of generating revenue. Midland, National Westminster and the Bank of Scotland all appear to be actively pursuing the smart card option. The Royal Bank of Scotland broke ranks with the other banks in 1991 when it became the first to introduce photographs on to its bank cards. Initially, only 30,000 cards were issued with photographs, although this procedure has continued for certain accounts and demographic areas where there is a particular fraud problem. The TSB bank and National & Provincial Building Society followed with the same approach in 1992. All three confirm that this is only a medium term option with smart cards being the key innovation for the 1990s. One senior executive at the Royal Bank of Scotland suggests that

'the introduction of a photograph on all bank cards'is not viable or cost-effective. The cost to all the banks would be in excess of £50 million and we cannot be certain that the long term benefits are there. We are confident however that consumers would contribute towards the cost, if the security aspect was enhanced'.

According to Card Technology Today, the concept of a photograph on a bank card is welcomed by as many as 85% of the public (see chapter five). The cynic would however suggest that this is because people are generally ignorant of the fact that they only have limited liability for transactions which are carried out fraudulently.

Mondex is the most important UK testing ground in this decade, with the feedback being used to make long term decisions. Whilst the cynics and competitors to Mondex are keen

to mock certain aspects of their approach, they do confirm their appreciation that Mondex will help the whole industry in identifying potential problems and concerns. One of these is how to upgrade the 18,000 or so ATMs located throughout the country? The upgrading of EFTPoS terminals is an even bigger task, especially for the larger retailers such as Sainsbury and Tesco. Most of the banks within APACS who were contacted could not draw any conclusions on this aspect, explaining that will 'just have to wait and see!'. Barclays and Lloyds bank appear to be taking a very secretive and offensive approach to Mondex with 'similar schemes being prepared, although not quite ready for introduction just yet'. Barclays have traditionally been the innovation leader within the adopting industry and many industry experts are waiting for their announcements to be made. A joint project is rumoured. In 1995, APACS announced a joint 'development partnership' with Delphic Ltd, suggesting an acceleration of the technological change that is 'planned' for 1997. This partnership between an industry association and a large technology supplier illustrates a further form of collaboration within the adopting industry.

#### **7.1.5 The Building Societies**

According to the Daily Express in September 1995,

'the future looks bleak for traditional building societies - since 1890 their numbers have fallen from 2,795 to 79 and look set to drop further'.

Many of the smaller societies are being bought by larger societies or banks, others are merging, for example the National & Provisional and the Abbey National and the Cheltenham & Gloucester with Lloyds Bank. Others are becoming Public Limited Companies to allow further expansion into a growing market. This pattern of expansion allows growth and increasing market share for the larger groups with a minimal effort, and is recognised as an ideal way of introducing new products and services to an existing portfolio. Walter Simpson, Director of Strategic Planning at the Alliance & Leicester 'predicts that there will be only 40 mutually owned building societies remaining in ten years time'. The largest building societies are listed in figure 7.3 which identifies the Halifax and Nationwide as the largest. The data was obtained by telephone during December 1994.

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**Figure 7.3 The Seven Largest Building Societies in the United Kingdom.**

	<b>Number of Branches</b>	<b>Total Assets £ Millions</b>	<b>Number of Investors 000's</b>
Halifax	692	67,200	13,400
Nationwide	718	35,300	8,100
Woolwich	490	25,200	3,200
Alliance & Leicester	405	21,000	4,500
Leeds	430	19,000	3,500
Bradford & Bingley	257	13,900	1,500

**Source: G Boxall, Open University**

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In comparison to the UK banks (listed in figure 1.1), the net assets and number of branches is considerably smaller. The largest bank, National Westminster plc., has over 2,500 branches compared to the Halifax Building Society with almost 700 branches.

In comparison to the clearing banks, competition between the building societies is more prominent with co-operation probably being restricted to sharing the 'LINK' ATM network. Whereas two banks are cooperating to introduce the Mondex electronic purse scheme, there are no joint technology trials by the building societies in the public domain. In fact, the building societies are taking a back seat, observing before acting, as there are many other more important issues to be negotiated. According to one card technology strategist at the Halifax building society.

'our society has no long term strategy in place - and I do not think any of the other societies do either. We are prepared to collaborate to combine ideas and help provide a alternative to the magnetic [stripe] card which does have its' limitations. We will concentrate on this area later, as there are more important issues first'.

The National & Provincial is the only building society to trial photo-bank cards, which although a great success in reducing card fraud, is still only seen as a temporary measure. They describe their photo-bank card as having 'a unique selling point' which makes it stand out from the crowd by attracting careful customers. One senior area manager suggests that

'smart cards are not at the top of my agenda. My performance is judged by my results next year and changing to a new [bank card] technology is not a short or medium concern'.



This manager is keen to highlight the suggestion that VISA is driving the technology forward (without reference to EMV which was not heard of by most building societies.).

'being a member owned organisation, it is probably the members collectively suggesting an alternative, that is motivating VISA to act globally'.

The building societies are taking increasing notice of APACS and its activities in the UK.

With increasing share option schemes for building society investors taken over during the first half of the 1990s, rewarding customer loyalty is becoming a key issue. Every society is considering ways of keeping their mortgage customers away from the lower interest rates being offered by the clearing banks, and bonuses are now given to customers who tie their savings into longer term savings plans. The view taken by the top four societies is that a new bank card technology would have to help to win back market share, not just reduce card fraud. The criticism outlined in chapter six (page 125) was put to the managers contacted that they do not keep their customers updated with details of new accounts or banking services. This is one area in which smart cards may be able to help, with more up-to-date information being stored on the card, prompting specific questioning or sales promotion when the card is used in ATMs.

More regulation will be introduced as the larger societies prepare themselves to become banks through the Bank of England, leaving the smaller groups to concentrate on specific markets or areas of business. A large majority of the society managers contacted did not know what a smart card or electronic purse was - the banks seemed to have more up-to-date knowledge in this respect, especially about Mondex. Surprisingly, of the six building society employees contacted, none of them were able to comment about Mondex, more as a result of the lack of knowledge, than commercial secrecy. Most of the ideas gained were through the public press announcements. To summarise, new bank technology and in particular the electronic purse is only an interesting concept, which will be considered more seriously by the building societies when the banks and/or EMV have a national system in-place, not just a few localised trials.

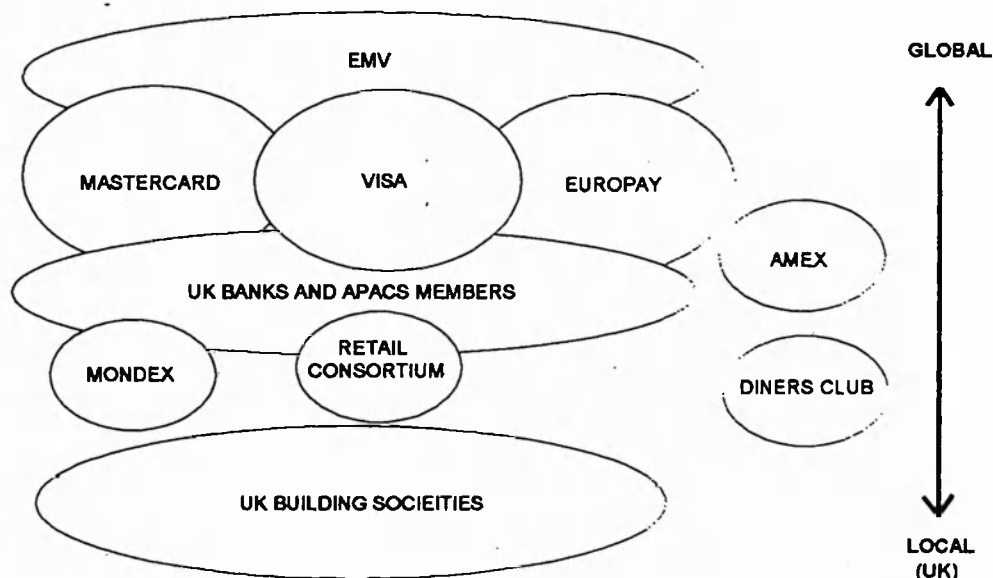
## **7.2 Competition and Cooperation within the Banking Sector**

In summarizing the approach taken by the banks and building societies, the main observation is the equilibrium of competition and cooperation. Most organisations want to be seen to be the first and most innovative in the adopting market, although jumping in too deep too quickly is seen as a long term threat. Timing is important. Keeping ahead without having to back-track, is key to ensuring steady growth within all of the financial organisations considered.

The illustration in figure 7.3 describes one possible interaction between these organisations. The more prominent and influential groups are brought into the foreground. Overlapping groups suggest some form of direct collaboration in which standards are being discussed, with a view to a global solution. There is a plethora of closed schemes in operation - some using smart cards, others magnetic stripe technology which are operating as totally independent schemes. Mondex may join EMV, setting international standards for the EU and possibly worldwide. Alternatively, EMV may break apart as EFTPoS'UK did during the late 1980s leaving each component to continue marketing their own products without following common standards. This would surely cause great confusion for the consumer and retailer. There is some evidence that the banks have learnt from their mistakes during the late 1980's when EFTPoS'UK was dissolved. And while both consumers and retailers are concerned about the fraud problem, there are more urgent issues which need to be carefully addressed - the cost of providing a service to the customer and the choice of financial products and services from which to choose.

The dominant partners in the UK are APACS and its member banks. The building societies, AMEX and Diners Club all appear to be taking a background stance, seeing what happens with Mondex and EMV before 'jumping in'. There is no doubt that they all have schemes in the side wings waiting to be launched - they are waiting for as long as possible before going public to achieve a greater impact at just the right time, learning from other schemes first. Globally EMV has the most influence with VISA and Mastercard probably being the dominant partners and taking the most aggressive view that smart card technology, without a doubt, is the only alternative.

**Figure 7.4 Interaction between competing and collaborating banking groups.**



**Source: G Boxall, Open University**

The driving force behind these enormous organisations to move the UK retail banking industry in a predetermined direction, without the banks publicly acknowledging it. EMV will dictate the protocol standard for all credit and debit bank card, with EFTPoS terminals being able to accept third party cards. Mondex is the only organisation which seems to put the main balance of influence on the consumer. If the consumer does not accept the alternative technology, then it will be more difficult to introduce and the introduction of a new bank card technology will take much longer than originally anticipated.

## **Chapter 8**

### **The Retailers**

Oliver Randell, IT Manager at Sainsburys, has seen many changes in the Point of Sale IT environment during his thirty nine years with the company. Explaining that the organisation represents many smaller retailers within one large organisation (selling groceries including an extensive range of fresh food, petrol, newsprint, tobacco and DIY hardware), Randall suggests that

'Life is becoming more complicated - Payment at Sainsburys can now be made using one of fourteen different methods. There is a greater need for consultation and cooperation in the months and years ahead between both the banking organisation and retailing consortium. In the past, change has crept up on us without us [Retailers] realising, but this time we all know that the smart card is coming'.

It should be noted by the reader, that Oliver Randall is 'devoted to smart cards at the PoS'. This chapter will consider the needs, concerns and proposals suggested by the retailers, both large and small and how they relate to the past, with emphasis on the EFTPoS 'UK scenario of the late 1980's.

#### **8.1 The British Retail Consortium**

The British Retail Consortium exists to represent the interests of Britain's retailers at European, national and local levels. This organisation, based in London, claim to

'represent over 90% of retailers through direct or associate membership. Key issues are debated within the association which assists in bringing forward new proposals at national level.'

The origins of the 'first' organisation date back to the early 1900s, although the British Retail Consortium came into existence in its' present form on 1 January 1992 following the merger of the Retail Consortium with the British Retailers Association. The organisation includes all forms of retailing through its company and trade association members, from multiple retailers to corner shops, from food and drink to furniture and DIY, high street and out-of-town retail to mail order.

Retailing as an industry accounts for over 20% of the UK's GDP and employs 1 in 8 of the workforce, playing an essential role in community life. The British Retail Consortium

claims to be the voice representing the interests of retailers on all major issues, with the aim of influencing the UK Government, UK and European Parliaments, the European Commission, other major organisations, local authorities and the general public. Close working relationships are maintained with the national, local and trade press as well as with the BBC and independent radio and television.

The consortium identifies its main concerns within the following headings; Distribution, Employment, Environment, Food and Drink, General Merchandise, Health and Safety, Information Technology, Payment Systems, Property, Security, Statistics, Taxation and Accounting and Trading Law. On these subjects, the consortium is governed by a council to which specialist committees report on policy issues, consulting the membership as necessary. Michael Wilsey, the assistant Director of the British Retail Consortium believes that there has been a considerable shift in the power base between the UK's banking and retail industry. Wilsey explains

'that beyond three years ago the banks were all powerful. I don't think they ever consulted or negotiated, but just laid down the terms. Government legislation, the work of the BRC and a growing spirit of cooperation between the retailers themselves has helped to bring about this change'.

## **8.2 Implementing EFTPoS at Store Level**

The data and quotations used in this chapter are a result of a series of interviews with a selection of large and small retailers I carried out during 1994 and 1995 and through comments made at key industry conferences. The retailers listed in figure 8.1 were contacted at store level and head office level where applicable.

They were first presented with a selection of questions to establish their position in the retail market and to identify that the most appropriate member of staff was being interviewed. EFTPoS and bank card technology was then discussed in as much depth as possible. A sample report used in these interviews is included in Appendix II.

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**Figure 8.1 Interviewing the retailers at shop floor level.**

<b>Name of Store</b>	<b>Location</b>	<b>Turnover</b>
Independent Grocer	Brighton	£ 200,000
Independent Grocer	Brighton	£ 300,000
Independent Newsagents	Brighton	£ 350,000
Group Newsagents	Brighton	£ 500,000
Independent Chemist	Brighton	£ 650,000
Group Off Licence	Brighton	£ 800,000
Independent Supermarket	Brighton	£ 1,400,000
Independent Garage Forecourt	Brighton	£ 3,000,000
Group Supermarket	Brighton	£ 3,500,000
Group Supermarket	Brighton	£12,000,000
Group Supermarket	Brighton	£19,000,000
Group Supermarket	Brighton	£22,000,000
Group Supermarket	Brighton	£27,000,000
Group Supermarket	Brighton	£30,000,000

**Source: G Boxall, Open University**

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Consider the basic needs of the retailer. According to Sainsburys, their IT managers are looking for a confidence in the level of service and a relatively fast response for on-line credit authorization through the EFTPoS terminal. Card technology is not a key issue, although the larger retailers are resigned to the smart card for future implementation, so long as they can work closely with the banks to please their common customer.

The furniture retailer, MFI, has four main considerations. The training of part-time checkout staff is a concern, being repetitive as new systems are constantly being introduced and revised by the technology suppliers. The physical lack of space at the EFTPoS also effects the customer image of efficiency. The reconciliation process at every store, over 200 stores, each having between 8 and 10 terminals already takes too long and the process would seem over-complicated for the resulting benefits to the retailer. During a presentation made by MFI at the Retail Solutions Conference, the subject of terminal upgrade was only briefly mentioned, although well emphasised.

'with over 2,000 terminals to upgrade, we would hold back on changing over to a new EFTPoS system until our next upgrade or the banks would have to pay!'

Ideally, MFI would like to see full implementation with existing EFTPoS systems, upgrading across the country on a phased basis. Most large retailers, including MFI, expect the latest EFTPoS system to remain in use for at least 5-7 years, with the banks and technology suppliers driving new technology forward.

In chapter six, I introduced the 'Shoppers Concern Survey' which was carried out by Lehman Brothers International. The same list of features was presented to a small number of retailers - whilst this cannot be assumed to be representative of the UK as a whole, there was a major difference between retailers and shoppers (figure 8.2). Retailers put product range and product layout above the need for a fast checkout and low prices. However, they do recognise the needs of the consumer, with each of the larger supermarkets claiming to have the fastest checkouts.

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**Figure 8.2 Shoppers and Retailers Concern Survey**

Importance	1992 Shoppers Concern Survey (from chapter six)	1994 Retailers Concern Survey (my research)
1st	Friendly staff	Friendly staff
2nd	Fast checkout	Product range
3rd	Low prices	Product layout
4th	Product range	Fast checkout
5th	Product layout	Low prices

**Source:** Lehman Brothers (1992) / G Boxall, Open University

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Even within the large supermarket, the need for a fast checkout is 4th in the stores requirement. A store manager of Sainsburys explains that

'it is not so much a fast checkout that is required, but a fast reaction time for us to have more staff working during busy period. Queues are traditionally an English problem, and we want to reduce these as much as possible. Technology does not necessarily help us to do this'

Within the larger retailers, all decision making is handled at head office. At store level, even the most senior staff, store managers etc., have only a limited knowledge of the retail banking industry. None of the twelve retail managers questioned directly had heard of APACS, The British Retail Consortium or Mondex. The large retailers (supermarkets in this respect) have high expectations from their EFTPoS hardware as detailed by one large

systems supplier.

They [The Retailers] would write-off the investment over a minimum of 5-7 years, with a guarantee that we can continue to supply parts and support for an additional 10 years. There are two discrete processes involved. A cross-functional evaluation team of perhaps 10-20 engineers and administrators will first draw up a specification of the requirements. This is usually a hybrid of what they have seen on the market and combines the ideas of many manufacturers. This initial process takes typically 9 months from inception to the second stage which is the competitive trial. This involves equipment from at least 2 preferred suppliers and can last a further 12 months. At this stage we still have to get final approval at board level. Up until recently, staff at shopfloor level were not involved. They now form part of the evaluation team.

Open systems are high on the list of priorities, replacing the traditional proprietary route.

Advantages of open systems considered important by the large retailers are

1. Increased choice in linking hardware from different suppliers together.
2. Reduced costs in systems development.
3. Greater choice of application software for retail application.
4. More choice for servicing contracts from more than one supplier.

This is not good news for the EFTPoS system suppliers as their products become a general commodity with increased competition and less up-front funding for the development of new technology.

APACS (1995, p4) estimate that there are approximately 400,000 retail outlets in the UK which can accept some form of plastic card and according to APACS, by the year 2000, a debit card will be used in preference for almost all retail purchases, about 3 billion transactions every year. This is already happening within the larger supermarkets. Payment by debit card at Sainsburys is increasing at every store throughout the country, and in one store increased from 17% to 50% of transaction between 1992 and 1995. APACS predict that cheque payment will remain predominantly non-retail. Within the smaller retailers and independents, the question of 'Who Pays?' for new technology still remains intractable as far as debit cards are concerned. In the past, in particular during 1987 - 1992, this was the major concern of the large retailers. As each negotiated with the banks and came to an agreement, others were obliged to follow, offering services such as CASHBACK as an incentive to capture more customers and recirculate the large amounts of cash generated at the checkout.



Clough (1994) suggests that

'CASHBACK is less controversial than ATM withdrawals because of signature verification (with all its faults) and because so many stores have in-house security personnel and CCTV cameras. It is cheap, efficient and popular and it keeps the cash in circulation rather than channelling it back to the banks. Importantly, it is not haunted by the spectre of phantom withdrawals.

In the past, large retailers had the advantage of buying power and could negotiate good clearing rates based on the volume of transactions and by using their financial 'muscle'. Small, medium and independent retailers were forced into buying or leasing their EFTPoS hardware to accept debit cards - with the merchant service charges being paid on top of these up-front costs. According to a senior manager at Tesco 'the larger retailers are not able to make any further savings on EFTPoS transactions, since the merchant acquirers have reduced their margins to fund the corporate business'.

The smaller retailers are NOT proactive, but will eventually react to long term change. The banks and building societies will have to provide EFTPoS terminals to smaller retailers at a very low cost or even free of cost, if debit or credit cards are going to replace cash at every retail outlet. Small retailers find cash useful. Part-time staff are paid in cash, in many cases avoiding the administration of PAYE and stock is often purchased on a just-in-time basis using cash to obtain the best discounts. None of the retailers interviewed were concerned about the cost or security problem of banking cash receipts. The attitude appears to be that the costs would remain the same whichever method of payment is preferred and that there are so few cases of burglary with violence that concern cannot outweigh daily administration convenience. One independent garage forecourt clearly points out that 'our insurance would cover any losses if we were hit - nothing has happened in my nine years with the company!'

The monthly trade publication 'Independent Retailer' suggests that Britain's small retailers will suffer badly in today's uncertain business climate if they do not take advantage now of the benefits modern technology can offer. It suggests that a fully integrated EFTPoS system bring immediate benefits in terms of financial control as well as allowing payment by all types of debit and credit card. It provides accurate daily stock figures allowing retailers to

accurately identify the popular faster moving stock lines and take account of seasonal variations. The small retailers still need convincing.

### **8.3 Payment Cards in Retailing**

The period 1990-1994 saw many developments in which APACS, the retailers and improved consumer education all helped to reduce bank card fraud, specifically at the EFTPoS. The main question hanging over these developments is whether or not it was necessary to spend vast sums of capital 'investment' on introducing hi-tech solutions such as laser-engraved photographs on bank cards, smart cards and biometric identification. The alternative was to concentrate on existing solutions with some relatively low cost additions, such as on-line credit authorization and a faster and more efficient procedure for retaining stolen cards.

#### **8.3.1 Bank Card Fraud in Perspective**

Bank card fraud is perhaps only a problem to the banks, and should be kept in perspective.

It is estimated by APACS that between 60% and 70% of this is lost over the retail counter throughout the UK. Since 1992 and the CARDWATCH initiative by APACS, losses due to bank card fraud at the EFTPoS terminal fell significantly during the period 1992 to 1995. This initiative concentrated on a clearly defined strategy to bring in more on-line card authorization, educate consumers about the value of bank cards and the importance of safeguarding PINs and formal training for retailers about checking cards at the EFTPoS. On-line authorizations provide better control, and with good support from the retailers, increased in the UK from 30% of all transactions in 1993 to over 60% in 1994. CARDWATCH is also responsible for the compulsory introduction of lower floor limits across the retail sector, particularly off-licences. Most retailers agree with this move, although admit that it has increased their administration. Brian Harvey-Bussell at Whitbread plc commented on the impact of this action on Threshers.

It came as quite a blow to be told that floor limits were to be reduced to such an extent that plastic card transaction authorisations would increase by 2,500 per cent! In fact our authorisation levels increased from around 100,000 per annum in 1992 to over 2.5 million in 1994. The response we had from our senior management was very guarded - approximately 1/3 of our stores had no fraud and 800 had annual fraud of less than £100'.

Thresher continues to cooperate with the banks on this issue and generally support the scheme, although it has incurred considerable cost to install the necessary EFTPoS hardware and provide staff training. Bank card fraud is low compared to other losses experienced by the retailers. The British Retail Consortium estimate that over £2 Billion is lost by retailers through all types of crime in the UK. This includes criminal damage and shoplifting although excludes losses due to bank card fraud. Shoplifting accounts for just over £1.5 Billion each year, and a staggering £200 million is spent by retailers trying to reduce this figure. Of the twelve retailers asked directly about losses due to fraud, every one confirmed that shoplifting is the main problem in this respect. A senior store manager at Sainsburys confirms the problem

'with 60% of our shop lifting is attributed to staff....yes, I have heard of collusive fraud and I am sure some of our staff have been approached, although it has never gone further than that. Now that we are on-line with floor limits, stolen cards get stopped quickly.'

CCTV is now being installed by retailers at high fraud prone areas such as major cities and motorway corridors and the electronic tagging of resaleable stock is high on the agenda of both small and large retailers.

### **8.3.2 The Preferred Technology**

Most retailers at shopfloor level do not fully understand what the technology options are.

Mention Watermark Magnetics or Xsec security and you will no longer have their attention. Smart cards have been heard of, but only an elementary understanding of the possible alternative bank card technologies is held by many of the staff working at head office level. Which technologies offer the best long term solution, in terms of security and data capacity? In almost every case, the different card technologies are not appreciated in enough detail to be able to answer this question.

Mention photographs on bank cards and most retailers have now seen them

'Photographs on Cards are good....I would like to see a whole lot more'

Independent Grocer

'Photographs on cards, please bring in more!'

Independent Garage Forecourt

'The photograph bank card is excellent, but we see very few'

Group Supermarket

Retailers appreciate that photographs on bank cards are only a short term solution and can easily be mis-read in a hurried situation at a busy point of sale. This method of security is also not at the 'leading edge' of technology. At the same time, they consider that alternative card technology will not be approved and adopted nationally for some time and photographs should be offered by more banks during the intervening period. Interestingly enough, watermark magnetics, optical cards, Xsec and biometric security and holomagnetics are understood by very few retailers, and where it is, by two or three senior 'technologists' at head office. Most retailers would also support the introduction of a national ID card. Every retailer interviewed for this thesis supported this and Mike Wilsey, Director of Professional Services at the British Retail Consortium confirms [Supermarketing 12/8/94] that

'we have already discussed identity cards in connection with them being added as a form of identification at the point of sale. A lot of retailers would welcome this.'

The larger retailers all have EFTPoS departments whose main responsibility is to keep up to date with the latest trends and ideas, although they are clearly not committing to too much, too quickly. With regard to the Mondex trial in Swindon, a Tesco spokesperson says

'We are always interested in new technology which will help us improve services. We believe customers will like this [Mondex] because they won't need to carry around large amounts of cash'.

Mondex claim that over 1,000 retailers have now signed up' [Mondex, 6/1995]. Other independent groups suggest that only about 500 have in fact signed up with others watching carefully. Retailers are nervous about two issues. Extra cost and increasing complexity.

### **8.3.3 The Influential - Banks and Larger Retailers**

Who influences 'market demand' and 'technology push'? Earlier in this thesis, the corporate model was suggested as being dominant in the early stages of the financial services revolution. In chapter five, VISA and Mastercard and the four main clearing banks were highlighted as having overall control in the UK, through APACS. The larger retailers are regarded by them as a technology catalyst.

The larger retailers support this argument. The smaller retailers also believe that the large retailers have more influence than they realise, leading the industry forward on a market driven basis with retail acceptance or rejection of new technology being first 'carried' by the larger corporate retailers. There is a good example of this. In 1993, the five largest supermarkets, Sainsburys, Tesco, Gateway, Asda and Safeway formed an ad hoc committee to fight their case in the European Courts. They claimed that the British banks were operating illegally as a cartel. Having invested heavily to accept debit cards such as SWITCH and VISA Delta, there was no reason to explain the ever increasing charges for the privilege to accept these cards, especially as the administration costs for the banks were falling. A statement for the committee publicly stated that

'Our members are no longer prepared to complain quietly; they want decisive action. These five retailers have been forced to join forces, having been unable, as individual companies, to hold any meaningful discussions on the subject'.

An agreement was formed before the case went any further, although the exact details were never released in the public domain. Publicity around large retailers helps to reinforce the message to the banks, as seen in the Daily Telegraph in 1993

'BP threw its weight yesterday behind growing criticism of bank plans to increase charges on Britain's 53 million debit and credit cards, and said it might stop accepting them at its 1,640 outlets. The oil company claims new charges could add up to £13.5 Million to costs, which would be passed onto drivers.....'

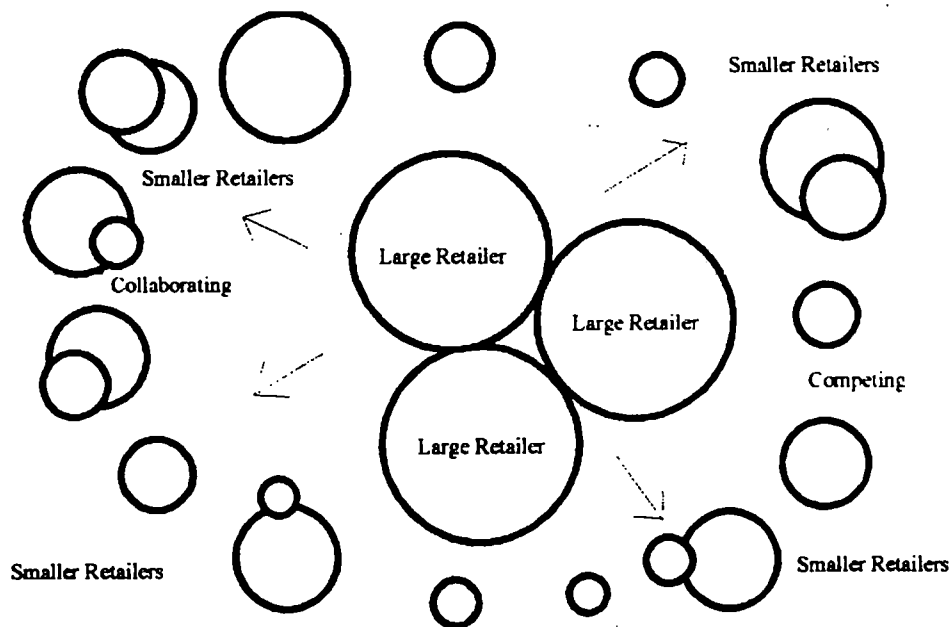
According to retailers, the consumer has very limited influence on new technology in the adopting sector. Whilst certain groups can voice their opinion and achieve modest publicity through the media, this only results in delaying any change. Likewise, small retailers also have limited influence, and whilst individual opinions can be channelled through the British Retail Consortium and the British Chamber of Commerce, this has insufficient effect on the industry at national level - for small retailers. The non-acceptance

of credit cards by certain retailers (notably John Lewis and Marks & Spencer) because of 'high bank charges also shows how large retailers can make their position clear. Small retailers observe the industry and technology at a distance, figure 8.3. Technology trials are initially agreed between the high street 'giants' and banking organisations with support from the technology suppliers. As new systems are adopted, the smaller retailers become interested. The Mondex electronic purse scheme is a good example of this. When Mondex began 'recruiting' retailers, the large retailers were approached first. The first members included names such as W H Smith, Woolworth, Asda, Sainsburys and Marks & Spencer. Tony Surridge at Mondex explains that

'the [Smaller] independents began joining the scheme after many of the 100 major stores had already signed up, in an effort not to miss out on the revolutionary project'.

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**Figure 8.3** Small retailers learning from the large retailers



**Source:** G Boxall, Open University

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### **8.3.4 Customer Profiling**

The ability to track customers purchasing habits and to use this information for direct mailing seems set to become an increasingly important asset to retailers. One of the biggest single developments in the early 1990s has been the introduction and then rapid growth of customer loyalty card schemes. These have adopted both magnetic stripe (eg., Argos Premier Points) and smart card (eg., Shell Loyalty Card) technology. In the long term, it is likely that the smart card schemes, although initially more expensive than the simpler magnetic stripe ones, can more than cover their costs and can prove very profitable. Individual retailers, however large, will not on their own achieve maximum benefit and an increasing number of retailers are considering cooperation and choosing between a number of potentially competing schemes. There could be an argument for combining the 'smart' payment card and loyalty card into one, as the EFTPoS terminal could be designed to accept both applications. In chapter five, we noted the opinions of the technology suppliers - that the market does not want 'secondary services' on a bank payment card. This is a valid point as retailers contacted regarding this issue confirmed that they prefer to differentiate between the two and that customer loyalty cards will always be closed systems, not operate on a multi-retailer, national basis. Retailers invest in customer loyalty schemes so that with the support of the 'right' marketing organisation, they can increase the size and type of their customer base, improve customer loyalty and identify the needs of consumers.

## **8.4 Retailers Learn from the Past - EFTPoS'UK**

It has already been shown that collective initiatives, like the APACS CARDWATCH scheme for example, can work. However, the example of EFTPoS UK during the late 1980s, which was conceived with the collaboration of many banks and retailers, demonstrates the potential hazards for collaboration. The history of EFTPoS'UK was outlined in Chapter 1.5. Not only was much time and money (approximately £120 Million) wasted, but the end result of deep-seated mistrust between the banks and retailers gives very little support to future cooperation. The only winners from EFTPoS'UK were probably the technology providers who took many lucrative orders for EFTPoS systems which all followed different standards. At head office level at least, the large retailers now have a chance to learn from the past, and any new bank card technology must not be short-lived.

Retailers view the trials which have taken place in the UK as interesting experiments -

particularly Mondex, Dallington and Meritcard. While there is support from the retail industry for the need to one-day 'upgrade' bank card technology, there are several elements which need to be clarified for them, the most prominent being as follows.

1. Which organisations are going to set the industry standard - assuming that it will be VISA / Mastercard, should it apply worldwide?
2. What authentication protocols will be required - will these include PINs, biometric identification and which encryption method is preferred?
3. Will multi-user applications be offered?
4. What government approval is required for the storage and transfer of personal data to/from the bank card - Data Protection Act?
5. Who will pay for the estimated industry investment of over £150 Million?
6. Open Systems are high on the list of priorities to replace proprietary systems.
7. Retailers own payment cards and customer loyalty cards must still be acceptable by replacement EFTPoS terminals.

One senior manager from a member bank of EFTPoS'UK summed up retailer attitudes in saying that

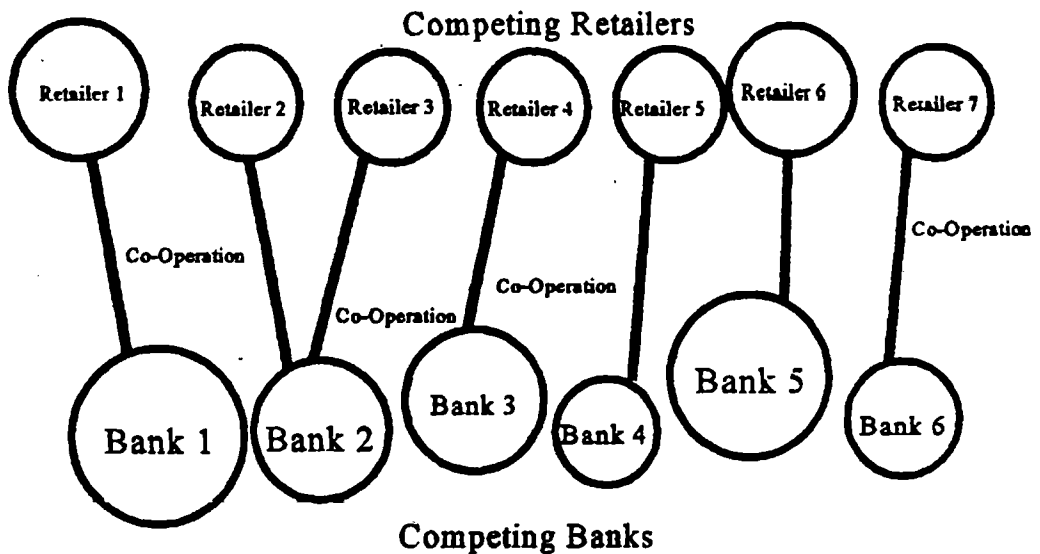
'I think that they [retailers] felt that the whole concept had been done by people sitting outside the shops thinking how it should be done rather than somebody looking from the shopkeeper's point of view and the customers point of view - more or less the same point of view in this case'

The banks initial approach to EFTPoS assumed the banks' right to decide the design of EFTPoS and the operational procedures to be followed. Retailers were to be consulted, but should wield no power. Whilst this caused the demise of the EFTPoS'UK organisation, ultimately the retailers had the winning cards. The antagonistic involvement of retailers helped to create interbank tensions and increased competition between the banks and building societies to become merchant acquirers. Figure 8.4 illustrates the cooperation between the banks and retailers during the confident months of EFTPoS'UK. There is an underlying competitive approach from bank to bank and retailer to retailer, each trying to gain the commercial advantage. After EFTPoS'UK, this moved to a situation in which there is more underlying cooperation between the retailers, figure 8.5, and between the



banks, although a certain degree of mistrust between the retailers and the banks.

**Figure 8.4 Competition between the banks and retailers during EFTPoS'UK**



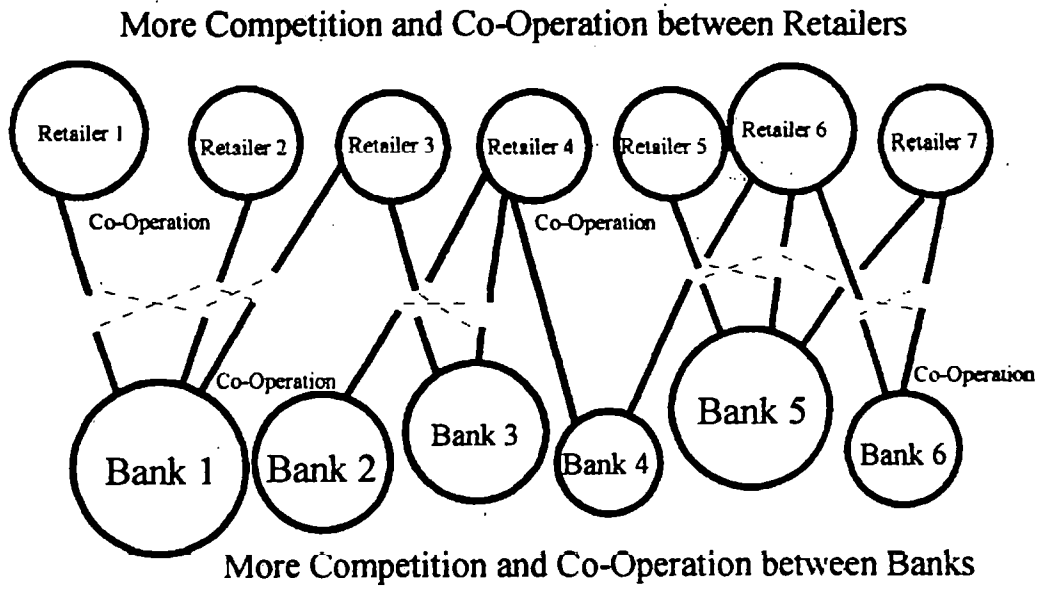
**Source: G Boxall, Open University**

In summary, retailers have less to say than the technology suppliers and banking organisations, but have learned from the EFTPoS' UK experience. What they do say is well emphasized and can be summarized as follows; Bank card technology is governed by the Banks, whether this means APACS, VISA, Mastercard, Europay or the big four is not easily differentiated by retailers. Retailers do NOT trust the banks and technology suppliers and while retailers will consider new technology, after the EFTPoS'UK experience, they will NOT commit large capital resources to new EFT terminals without good reason and a clearly defined payback.

Bank card fraud was a concern, although with the CARDWATCH scheme in place and more on-line authorization with lower floor limits, retailers are now more concerned about reducing financial losses which are a result of shoplifting and internal theft by staff. Schemes like Mondex have the support of the retailers. Larger retailers have an increasing amount of influence on the adopting industry but the smaller retailers follow change.

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**Figure 8.5 Cooperation between the retailers after EFTPoS\*UK.**



**Source: G Boxall, Open University**

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## **Chapter 9**

### **Other Influential Players**

The general public are kept informed of the news every day, whether through reading the daily newspaper, watching television news, listening to the radio, searching through the teletext pages or through the internet. Political, environmental, social and technological views can be changed through publicity and the critics can soon build or divide the general public's confidence in a new scheme or social idea. This chapter will introduce and evaluate the ways in which the media, the government and progress in other EU countries can influence new innovation in the retail banking sector, concentrating on bank card technology.

#### **9.1 The Tabloids and Broadsheets**

Newspapers inform us of what is happening around us, with a local, national and international viewpoint. Headlines can say a great amount in just a short sentence.

People in Swindon yesterday became reluctant guinea pigs in the pilot study for the launch of the Mondex card, hailed as the start of the cashless society'

[Daily Telegraph 4th July 1995]

The Daily and Sunday newspapers published in the UK are listed in figure 9.1 with their circulation figures and publisher, details of which were provided by each papers 'news office'. This list equates to approximately 94,000,000 national newspapers being published every week in the UK alone - excluding local and free issue newspapers. On average each newspaper will be read by 1-2 persons. Whilst news journalism has its' own trade unions, professional associations and codes of conduct, it is often compromised by its' collusion with those with 'power' in society , invasions of personal privacy and chequebook journalism. Many head line stories are distributed throughout the world through news agencies which can range from publicly quoted companies (Reuters), state-owned concerns (TASS) to small private operations. Many of the reports relating to retail banking are released into the public domain by companies who are commercially or technically involved in a project as a supplier or promoter. Editorial publicity is the most cost-effective channel of communication - compared with advertising, its' cheaper, has as much as five times the readership and more importantly, has higher credibility.

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**Figure 9.1 National Daily and Sunday Newspapers Published in the UK**

<b>Daily Newspaper</b>	<b>Circulation</b>	<b>Publisher</b>
Daily Express	1,490,000	Express Newspapers
Daily Mail	1,769,000	Associated Newspapers
Daily Mirror	2,676,000	Mirror Group
The Daily Telegraph	1,024,000	Telegraph
The Guardian	416,000	Guardian
The Times	368,000	News International
The Independent	349,000	Newspaper Publishing
Daily Star	25,000	Express Newspapers
The Sun	3,514,000	News International
Today	533,000	News International
Financial Times	290,000	FT
Evening Standard	460,000	Associated Newspapers

<b>Sunday Newspaper</b>	<b>Circulation</b>	<b>Publisher</b>
The Independent on Sunday	369,000	Newspaper Publishing
The Mail on Sunday	2,052,000	Associated Newspapers
News of The World	4,639,000	News international
Sunday Observer	513,000	Observer Newspapers
The People	2,300,000	Mirror Group
Sunday Express	1,721,000	Express Newspapers
Sunday Mirror	2,667,000	Mirror Group
The Sunday Telegraph	581,000	Telegraph
The Sunday Times	1,218,000	News International

**Source: G Boxall, Open University / Publishers News Office**

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Newspaper publishers exist to sell newspapers and editors follow important guidelines to help them achieve this. One assistant editor of a national tabloid explains that

'the headline is vital and must, at first glance cause the reader to read on, rather than discard the newspaper or return it to the shelf. The story stands or falls on the first paragraph and must contain the main news angle, written from the readers point of view. The following paragraphs elaborate on the main story - superlatives and exaggerated claims are avoided - in many circumstances!'

All organisations communicate with the media, here APACS is taken as an example. The public affairs objectives of APACS can be divided into pro-active and re-active. The pro-active work involves a significant level of education about ATMs and EFTPoS payment systems to the general public. A programme of focusing on positive opinions is promoted

by APACS to create a greater awareness of the retail payments industry. APACS confirm in their annual report that 'not surprisingly, plastic card matters form the largest number of enquiries handled by the association'.

Re-active publicity concentrates on media criticism of the banks, notably the litigation between banking customers and APACS members in which the plaintiffs claim they have suffered phantom withdrawals from ATMs. This particular sector of the media continues to give its support to technology issues in the back pages whilst the majority of front page news concentrates on criticism of the banks and building societies, relating to excessive charges to consumers and retailers. It is very much of a damage limitation exercise for the financials, confirming one's value for money in a competitive market.

In summary, perhaps as expected, newspapers do have influence on the retail banking sector, although for most of the time this can be described as being in dynamic equilibrium.

## **9.2 Market Related Publications**

In the adopting sector, there are a variety of leading publications which can be divided into three categories (figure 9.2). The subscription costs of these 'trade' publications vary considerably from £599 (Retail Banker International) to no charge (Chip Chat). Each publisher was telephoned to find out their circulation figures, and whilst the majority would provide this information, the publications marked n/a (not available) were not prepared to provide this data, usually for competitive reasons. There is evidence to suggest that the publications which charge provide more editorial and fewer advertising pages. These publications provide more market trend and supplier/consumer attitude data. Examples are Card Technology Today, Retail Automation and European Card Review. It is safe to assume that the editorial within these publications is occasionally biased and that periodicals often have 'interests' in particular application trials. An example of this was discovered during the media research for this thesis. One publication which had regular, positive updates on a particular retail banking trial was found to be a major shareholder of and supplier to the same trial. It was not surprising to discover that many of the key personnel involved in all aspects of the trial subscribed to that publication.

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**Figure 9.2 Retail, Banking and Technology Publications available in the UK**

<b>Retail Publication name</b>	<b>Circulation (July 1995)</b>	<b>Publisher</b>	<b>Frequency</b>
Retail Automation	12,000	RMDP	Monthly
Retail Technology	15,000	BPL	Monthly
Customer Loyalty Today	500	SJB Services	Monthly
Independent Retailer	23,700	Rangethorn	Monthly
Retail Week	19,000	MBC	Weekly
Loyalty	14,000	C&M	Monthly
Forecourt News	12,000	Hasting	Monthly
Supermarketing	n/a	n/a	Weekly
European Supermarkets	n/a	Crier	Bi-Monthly
<b>Banking Publication name</b>	<b>Circulation</b>	<b>Publisher</b>	<b>Frequency</b>
Banking World	n/a	Banking Institute	Monthly
Banking Automation	n/a	n/a	Monthly
Financial Systems	n/a	Mitre House	Monthly
Credit Card Management Europe	n/a	Faulker & Gray	Monthly
Card World	n/a	C&M	Monthly
Fraud Watch	n/a	C&M	Quarterly
Card Watch	30,000	APACS	Quarterly
Money Moving and Management	n/a	n/a	Monthly
Retail Banker International	n/a	Lafferty	Bi-Monthly
Private Banker International	n/a	Lafferty	Monthly
Electronic Payments International	n/a	Lafferty	Monthly
The Scottish Banker	13,300	Banking Institute	Monthly
Banker	17,000	Banking Institute	Monthly
<b>Technology Publication name</b>	<b>Circulation</b>	<b>Publisher</b>	<b>Frequency</b>
Chip Chat	3,000	SJB Services	Monthly
Post News	2,000	Post News	Monthly
World Card Technology	900	Lindley	Monthly
Smart Card News	200	SCN	Monthly
Card Technology Today	1,000	SJB Services	Monthly
Biometric Today	500	SJB Services	Monthly
In Touch	300	Smartex	Monthly
A la Card Euro-News		Hoppenstedt	Monthly
Cards International	n/a	Lafferty	Bi-Monthly
Card Manufacturing	n/a	ICMA	Bi-Monthly
European Card Review	n/a	ECR	Bi-Monthly

**Source:** G Boxall, Open University

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### **9.3 Television and Radio Advertising - Celebrity Appeal**

Sales and marketing often involves some form of celebrity appeal - using a well known and sometimes popular celebrity to promote and endorse a product. One of the best examples in the adopting industry, is the series of television commercials employing the 'blundering' Rowan Atkinson to portray the advantages of carrying the Barclaycard VISA card on your travels. In a survey carried out by 'The Planning Partnership', just over 1,000 people were asked to recall the celebrity used and product advertised in the most memorable television commercials. The top three were Bob Hoskins / British Telecom (remembered by 77% of the sample). Gary Lineker/Walker's Crisps (77%) and Rowan Atkinson/Barclaycard (60%). The creative director of BMP who made the Walker's Crisps commercials explains that 'you have to ensure that the celebrity are inextricably linked to the product so they don't dominate'.

Celebrities are also used to help reduce crime. Sergeant Chris Gibson from the West Midlands Police Fraud Squad acknowledges that during a joint awareness campaign with retailers in the West Midlands during early 1994,

'most people didn't realise how valuable their cards are in the wrong hands. They were surprised to learn that a fraudster can spend an average of £250 before a card is reported lost or stolen. People should make sure they know where their cards are at all times - so that if they are lost or stolen, they can be cancelled immediately'.

In this example, the campaign team were helped out by 'Tosh' (actor Kevin Lloyd) from the television series 'The Bill', whose celebrity appeal helped draw the crowds and increased the opportunities for spreading the 'look after your cards' message. An important part of the campaign was to advise local retailers on how they could prevent bank card fraud, and in particular, how well trained staff can prevent a shop from becoming a target for the criminal.

### **9.4 Competition or Collaboration: The Smart Card Club**

In addition to organisations such as APACS and The British Retail Consortium, there are also similar organisations representing the technology supply industry. The Smart Card Club would seem to be the most prominent within the UK. Formed in January 1993 by Richard Poynder, the Smart Card Club was set up to help and assist organisations to understand the potential of smart card technology. By encouraging education and informal

debate at monthly meetings, the club takes an active role in forming co-operation between different suppliers and would-be scheme operators. Since its formation with a membership of 22, it has continued to grow steadily, reaching 133 members in June 1995. The balance between suppliers and 'scheme operators' and some example members is shown in figure 9.3 and the full list of club members available from Smartex Ltd. The full list of members showing a strong involvement by many blue chip companies, is clear evidence that the club has influence within the industry. Clubs on the same theme have also been introduced in the Czech Republic, other European Countries, South Africa and Asia/Pacific.

**Figure 9.3 Membership of the Smart Card Club (with example organisations)**

<u>Suppliers</u>	<u>Scheme Operators / Users</u>	<u>Retailers Forum</u>	<u>Others</u>
59 members	37	24	13
Datacard	Mondex	Boots The Chemist	
Landis & Gyr	Amex	Dixons	
AT&T	VISA International	Sainsbury	
De La Rue	Girobank	WH Smith	
Gemplus	Lombard Tricity Finance	Woolworth	

**Source: Smart Card Club (via Smartex Ltd, July 1995)**

Following its formation, the club has also established forums to discuss specific applications such as Utilities, Leisure and Retailing. Richard Poynder explains the background to the retailers forum.

'An objective of the Club is to ensure that smart card systems are developed in a cohesive manner under relevant standards. Four banks and two credit card companies are members of the Club, and they join each month with retailers and suppliers in pursuing these objectives. The retailer forum is addressing their common relationship with smart card issuing banks, on a commercial front in respect of charges, and on an operational front with regards to the need for common routines at the Point-of-Sale.

Poynder confirms that there is both a degree of collaboration and competition between club members. VISA, Mastercard and Europay International have joined forces to develop common specifications for their members' smart card credit card terminals, although the individual member banks 'may not tow the line, and they may do their own thing on a



private basis'. A reference to one major UK clearing bank [Barclays] is made in this respect.

Some important observations are made by the Smart Card Club in relation to the adopting sector. We can already appreciate that EMV (Europay, Mastercard and VISA) have publicly declared their intention to convert to smart card technology over the next five years. Poynder estimates that by the year 2000, we 'can expect some 100 million smart debit and credit cards in the UK - the position of AMEX and Diners is less clear', perhaps as limited public commitment has been made.

Compatibility is a concern, especially between other countries in the EU, with France being highlighted. Poynder believes that the electronic purse (eg. Mondex), if implemented universally, could provide the most innovative and useful facility for the consumer. The main problem being that in the EU alone, there are some twenty different schemes being developed and Poynder describes the scene as a 'total muddle, with little compatibility, a lot of talk about working together, and in reality, a serious card war is looming'. The EFTPoS'UK lesson of the late 1980s is often referred to at club meetings and will not be repeated according to many of the club members. The industry is wiser as a result of this event and the retailers will act in a more aggressive fashion to ensure that their needs and wishes are accommodated by the banks and technology suppliers. The retailer forum is working hard to ensure that this is the case. Certain club members agree that the banks are concentrating some of their efforts on 'the new era of remote customer access' Referring to telephone banking. One influential supplier believes that

'he who delivers the first universal home banking terminal will get very rich and powerful, but will also open the door for nasty foreign banks to offer financial services to UK consumers without having to have a physical branch network.'

Who has the most influence within the adopting industry, according to the Smart Card Club? Poynder has clear ideas on this, with the comment

'I do not think that consumer demand or understanding is sufficient to create a market pull from that direction, and retailers are tending to be followers and reactors rather than pioneers, with one or two exceptions. For retail payment cards, it is the banks and credit card companies who most certainly are creating the new market place, and are likely to dominate it for the foreseeable future.'

## **9.5 Government Strategy in the United Kingdom**

Politicians concentrate on their short-term objectives, usually the next 3-4 years by when the next general election is due. Public opinion comprises the judgements and ideas among people on a particular issue. Minority views can carry more influence than majority ones and some forms of public opinion are more coherent and effective than others, such as the views of pressure groups formed to protect the interests of their members - with representation through a particular union or MP for example. The enactment of legalisation takes the form of making an Act of Parliament or Statute. All legislation is introduced as a Bill, being a draft of the proposed Act which can originate from a variety of sources. Before the Bill is drafted, discussions and negotiations take place and the appropriate interest groups may be consulted. In the adopting industry, these groups should include retailers, bankers, technology suppliers and possibly the consumer.

### *The Data Protection Act*

Computers are used throughout society, collecting, storing, processing and distributing information. Much of that information is about people and is subject to the Data Protection Act. It was introduced to give important rights to individuals about whom information is stored on a computer. They may find out information about themselves, challenge it if appropriate and claim compensation in certain circumstances. The act places obligations on those who record and use personal data, in the case of the adopting industry, the banks and building societies, who are already registered through the Data Protection Register. The integration of smart cards, which can easily be considered as a small personal computer, would probably require some form of registration at some stage in the issuing procedure. Whilst the government has no need to become involved until the implementation strategy has been planned for the at least the first stage of national roll-out, there are already concerns within UK data protection agencies over civil liberties. In the 1994 Annual Report, the UK's registrar for Data Protection, Eric Howe stated that

'smart cards have data protection and privacy implications in respect of who shall have access to the personal data on them and who shall have the ability to read, add to or alter this data....[regarding the national ID smart card]...there should be a careful evaluation of any benefits which might flow from such a system and a weighing of these against the undoubted risks to privacy and personal freedom. This issue is too fundamental for the UK to allow itself to simply slip into having a defacto national identification system without the necessary restrictions and safeguards'.

In the same report, Howe quotes from a bill of rights proposed by Tom Wright, the Information and Privacy Commissioner for Ontario Canada, who insists that

'data subjects [people] should know their inherent rights when using the ID smart card, what information the card contains, how it will be used and what risks that use implies.....smart cards should only be used by government organisations to enhance access to government information and services and not as an instrument of social control, surveillance or as a means of creating computer profiles'.

The UK's registrar for Data Protection has certainly taken notice of his comments, enough to include them within his annual report.

### *The Monopolies & Mergers Commission*

The Monopolies & Mergers Commission is a government body set up in 1948. It has the main responsibility of investigating activities which may be against the public interest, particularly with respect to mergers, takeovers and monopoly situations. A monopoly is a situation in which a lack of competition can result in excessively high prices to the consumer, either to boost profits or because of a lack of investment from other organisations to invest in new innovations. The adopting industry has rarely been accused, if ever, of being in a monopoly position. Whilst there are a number of mergers between financial organisations (consider Cheltenham & Gloucester Building Society and Lloyds Bank), the individual market share of the new organisations is still small. Industry suggests that the UK government will observe 'progress' from a distance, without becoming too involved, too early.

### *Government Investment*

The updated smart card banking system in France was initiated by direct investment from the French Government, with profits of these organisations being smaller than the equivalent in the UK and an increasing problem with fraud causing national concern. Two MPs in Sussex were telephoned and the proposal that the UK government should invest into the updating of our national bank card system, as a flagship in the EU, was suggested. It is unlikely that similar direct investment would be made in the UK - there are more consequential demands for the treasury and the bank's annual profits should, in part, be invested into reducing bank card fraud and providing more confidence for the banking system as a whole. Financial losses due to bank card fraud are now falling each year, and the urgency for an alternative technology is not as high as previously thought. The idea

that this trend of falling losses each year is statistically a political indication was dismissed. The situation during the mid-1990s indicates that the adopting industry is a secondary political issue with housing, education, the economy, law and order and the NHS being the more consequential 'electoral' issues. Growing publicity over the possible introduction of a national ID card is considered to be an initial testing ground for smart cards to be used in other applications - retail banking for one. In late 1995, the UK Government made it clear that they had decided not to select smart cards for the next format of DHSS Identity/Benefit card - magnetic stripe will suffice, offering a balance of technical capabilities against overall cost.

### *The Technology Initiative For Disabled and Elderly People*

Gill (1996) has carried out some interesting research on the requirements of disabled and elderly people who form a greater proportion of the population than most people realise. His conclusions suggest that

'the advent of multi-function smart cards will necessitate much closer collaboration between financial institutions, telecommunication companies and public transport operators'.

Concentrating on the retail banking sector, in particular the use of ATMs, Gill suggested ten typical problems which occur when disabled and elderly people withdraw cash or try to obtain account information. One suggestion was for the introduction of a bank card designed around contactless smartcards, operating from a distance of about 10cm.

## **9.6 The European Union and Electronic Purse Schemes**

Six countries formed the basis of the European Union (EU) when the Treaty of Rome was signed on 25 March 1957. On the 1 January 1973, Britain and Ireland joined and by 1993, there were twelve members in total. The main objectives today are to develop a closer economic, social and political unity through the following methods.

1. Removal of trade barriers between member states.
2. Common customs tariffs and commercial policies towards third countries.
3. A common agricultural policy.
4. The free movement of persons, services and capital between member states.
5. A common transport policy.
6. Rules against unfair competition.

In particular, objectives 1,4 and 6 all have some influence on the development of new bank card technologies within the EU. The reader should by now appreciate the distinction between electronic purse schemes which are principally cash on a card and electronic bank cards which are used to gain access to the bank current or credit card account. Let us first consider electronic purse schemes. These schemes, using smart card technology, have been expanding across the EU since the first scheme in Denmark, called 'Danmont', went live in early 1992. This was quickly followed by similar schemes in Austria, Finland, Portugal and Spain. European Card Review reported in January 1995.

Indications are that purse schemes will be welcomed by all participants in the card equation. Banks gain from reducing cash handling and from establishing new revenue streams. Merchants gain from lower costs, greater security and quicker flow-through of cardholders - for whom the outstanding benefit is less hassle, particularly when travelling.'

Figure 9.4 identifies the EU electronic purse schemes which were either live or in the process of being set-up as at Autumn 1994. This data was collected through a variety of sources, including conference proceedings and market literature. All of these schemes use smart card technology with each operator arguing that other available technologies (see chapter three) do not offer the required balance of economics, security and flexibility.

Why are these schemes proliferating? The Portuguese banks see PEP (Portuguese Electronic Purse) as a defensive manoeuvre, and Xavier Libret, Manager for the Gemplus card technology being used, comments.

'The Portuguese banks are giving a strong advantage to their own bank community, in terms of their market share, against new competitive elements coming from Telecom operators and other newly formed financial services providers'.

In Portugal, SIBS (Sociedade Intebancaria de Servicos) have initially issued 500,000 cards and are taking a global view by promoting the scheme as a solution outside Portugal. As Dos Santos states on behalf of SIBS, 'We are the only country in Europe which has developed an electronic purse framework suitable for countries like France and the UK'.

This is debatable. Mondex, the UK equivalent is just one in the list of schemes making the same claim, as rights to franchise Mondex are being offered in many EU countries and the Far East.

**Figure 9.4 European Union Electronic Purse Schemes**

<b>Country</b>	<b>Operator</b>	<b>Scheme Name</b>	<b>Status / Late 1994</b>
Austria	APSS	Quick Card	Starts in Q4.1995
Belgium	Banksys	Proton	Starts in Q1.1995
Czech Republic	IDS	Easy Card	100,000 cards issued
Denmark	PBS	Danmont	Live since Q4.1992 200,000 cards issued
Finland	Toimiraha	Avant	Live since Q3.1993
France	La Poste / GCB	PTT	Planning
Germany	P Card / Geldcarte	-----	Initial discussions
Italy	ABI / SSB / Minipay	-----	Initial discussions
Latvia	Union Baltic bank	-----	Initial discussions
Netherlands	Interpay Chipknip	Chip Kaatbeurs National banks	Starts in Q1.1995 Starts in Q1.1995
Norway	Bankaxept	-----	Initial discussions
Portugal	SIBS	PEP	50,000 cards issued
Spain	SEMP	TIBC	Live since Q3.1994 40,000 cards
Sweden	SMIL	Sparbanken	Starts in Q3.1995
Switzerland	Telekurs	-----	Initial discussions
Switzerland	Swiss PTT	PTT Card	Planning
United Kingdom	Mondex UK New scheme to Mondex	Mondex  Banks (details not issued)	Starts in Q3.1995

**Source:** Selection of Retail / Banking / Technology Publications

Danmont, the scheme in Denmark, is regarded by the adopting industry as a first generation electronic purse scheme and has gained expertise and knowledge of benefits and problems faced by such schemes. By early 1995, Danmont was available in 32 of

Denmark's towns and cities and the 'flag' went up announcing this scheme as a technological first in the EU. A senior manager behind Danmont explains the positive feelings following the success of the scheme; 'Compared with all the pilots and scheme studies, we have actually done it! Our dream now, is the multifunction card. But it is not necessarily a task for Danmont'.

In Belgium, the Proton card is aiming to set a precedent by being the first electronic purse scheme in this country. Armand Winkens, Director of Sales and Marketing at Banksys confirms that

'What we are trying to achieve is to have a single electronic purse, avoiding separate cards from different issuers for telephone, retail and transport services. The multifunction card is a long term aim. The elimination of fraud is not the rationale for chip [smart] cards. Debit card transactions are 100% PIN based in Belgium and unlike our friends in the UK, we have zero fraud'.

In Germany, there are a number of companies studying electronic purse schemes for national implementation, but because of the risk of compromise, they are unlikely to proceed until the technology is perfected and the plans by EMV are more concrete.

How does all of this relate to bank card technology? The participants in each country are going through the technology learning and process, whilst at the same time, trying to keep the competitive edge within the EU. Each scheme operator increasingly recognises that the potential market for a successful electronic purse is cross-borders using the potential facility to store many currencies on one card. An ambition to include the ECU on the card is expressed by many operators. Christine Woillez, head of VISAs smart card project does suggest however, that

'the most important point, for me, is that the electronic purse has to complement existing cards, not compete with them. That means focusing on small transactions - but there is a debate on what is small and it will have to be specified country-by-country'.

## 9.6 The European Union and Bank Cards

The investment into new bank card (debit and credit card) technology within the EU is being handled by EMV. The banks in each respective EU country are waiting for EMV to set the standards, timescales and procedures for a new bank card technology. At the same time the components of EMV( working alone as Europay, Mastercard and VISA) have other ambitions - to offer both the electronic purse and 'smart' debit card possibly on one card. Europay International plans to roll out their cross-border electronic purse, 'Express', by the end of 1996. VISA and Mastercard are developing similar schemes for introduction by 1997. What might this mean for the scheme operators listed in figure 9.4? More competition, perhaps with the smaller schemes collaborating to increase market-share. The European card statistics produced every year by Europay and VISA EMEA indicate that debit cards continue to be the most widely-used form of bank card in Europe as a whole. By early 1994, there were nearly 100 million Europay and VISA debit cards issued in Europe which had cross-border functionality and 108 debit cards issued by a selection of banks as 'closed' payment systems such as Switch, Barclays Connect, Bankomat in Austria, Cartes Bancaires in France and S-Karte in Germany. In total this gives around 208 million debit cards in relation to the 62 million credit cards. The largest ten European card markets in Europe for 1993 are identified in figure 9.5 - although the actual figures are not shown for all three years, in every country, there was an increase from 1991 / 1992 / 1993.

In the major European economies, France and the UK are the most obviously mature card markets and perhaps the base from where a new card technology will evolve. France does however have the advantage. Every country, except France, still uses magnetic stripe technology on bank cards. It is important to have a brief understanding of the history behind the introduction of 'smart' bank cards in France.

Smart cards technology in the French retail banking sector evolved during the late 1980s as a result of vast investment by the French Government in the PTT telephone system. With increasing vandalism, Schlumberger worked closely with government departments to redesign the complete public telecommunications network and replace all cards with 'smart' technology.



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**Figure 9.5 The Ten Largest European Card Markets By Country**

<b>Country</b>	<b>Total Expenditure (US\$ Billions)</b>	<b>Number of Transactions</b>	<b>Number of Bank Cards Issued (millions)</b>
France	93.2	1,130.5	15.4
United Kingdom	86.1	1,353.5	41.5
Germany	22.9	204.2	45.9
Spain	17.9	204.1	14.3
Italy	6.1	52.6	8.1
Switzerland	5.7	39.4	3.8
Sweden	4.5	48.5	2.5
Netherlands	4.3	42.1	11.8
Belgium	3.9	35.0	5.9
Portugal	2.2	32.5	1.5

**Source: Europay International, VISA 1993**

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During the initial period from 1984 to 1987, vandalism fell by over 40% and the number of out-of-order public pay phones fell from 12% to 3%. Revenue increased by over 10% during 1986 and 1987. Following this resounding success, working with 'Cartes Bancaires', the complete payments system was overhauled and by December 1990, 20% of the issued bank cards were replaced with smart card technology. By 1994, every bank card in France had been upgraded and according to Mr Max Auriol, Chief Administrator at CB, the

'economic justification for changing bank card technology in France was security, and providing new services or advantages for the consumer was NOT top priority. France was traditionally noted as having the highest growth of card fraud in Europe'.

Most of the other countries within the EU draw parallels to the UK in retaining magnetic stripe technology for the present time. The exceptions are Norway, Switzerland and Italy, who are all slightly 'ahead' with their evaluation of smart cards as an alternative. Norway is probably the most advanced, with only 4 million inhabitants and just over 1 million bank accounts, the Norwegian Bankers Association (their equivalent to APACS in the UK) made a commitment in 1993, to 650,000 debit smart cards from Bull Information Systems.

Norwegian bankers claim that the move was warranted by the need to reduce the cost of processing cheques and to use an off-line system for authorization to combat the high cost

of telecommunications in the industry. An initial pilot scheme in the town of Lillestrom has led to eventual national implementation. It is interesting to note that the operation systems arranged are independent from VISA, Mastercard and Europay.

In Switzerland, technology trials have been in progress since 1988 using smart cards with PIN identification. Initially launched by the Swiss PTT (telephone network operator) and Ascom Autelca, the Swiss banks are reserved about full national implementation because of the EMV discussions planned until 1997.

In Italy, a consortium of 12 banks has launched an off-line PoS network using smart card technology. Retailers participating in the scheme download transactions in one batch and receive a 'hot' list of stolen and lost cards during the night. The last 150 transactions are stored on the card and the ambitions of some of the participating banks is to store medical records and pre-paid tokens for public telephones and car parks on the same card. Perhaps this will be the first multifunction smart card in the EU which also adopts retail banking? The fact that there are so many schemes being trialed within the UK allow organisations like Mondex to 'go it alone' without collaborating with the EMV consortium - even if a small market share is achieved this is surely better than nothing, and the resulting EMV card can sit along side any other 'closed' or national system? This leads to a further important aspect which needs a mention.

In any given monetary scheme, the issue of value is matched by a receipt of money to cover the value in circulation - this in effect is the responsibility of the Bank of England. Similar provisions apply throughout the EU. One question which has been asked at the EU Headquarters in Brussels relates to how safe the card issuers feel bearing in mind that electronic purse schemes may not be covered by this guarantee. Banks could be challenged on the basis that they are just selling a service. The European Monetary Institute produced a report in May 1994 which concluded that the issuers of what it called 'electronic purses' should be restricted to credit institutions only. According to Howcroft (1995), we can expect to see more directives from Brussels as smart cards are introduced generally.

## Chapter 10

### Conclusions

The influential groups contributing to card technology innovation in retail banking were identified in the introduction. Each group of players listed in figure 10.1 has been considered in the thesis, in the chapter indicated.

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**Figure 10.1 The four influential groups of EFTPoS in Retail Banking**

<b>Group I Technology Supply Industry</b>	<b>Group II Adopting Industry</b>	<b>Group III Market</b>	<b>Group IV Other</b>
Card Manufacturers	Banks	Consumers	Media
EFTPoS Terminal Manufacturers	Building Societies		Government
ATM Systems Manufacturers	Retailers		European Countries
Chapter 2 Chapter 5	Chapter 1 Chapter 7 Chapter 8	Chapter 6	Chapter 9

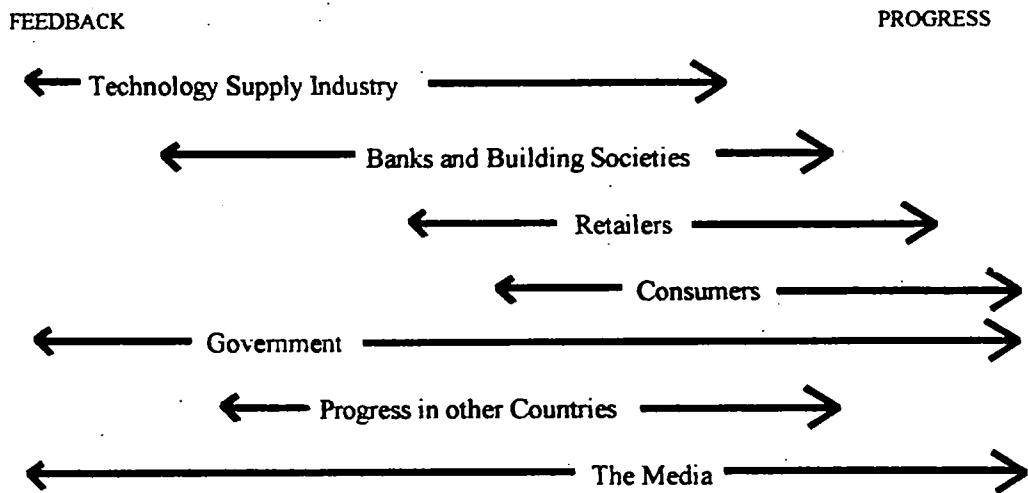
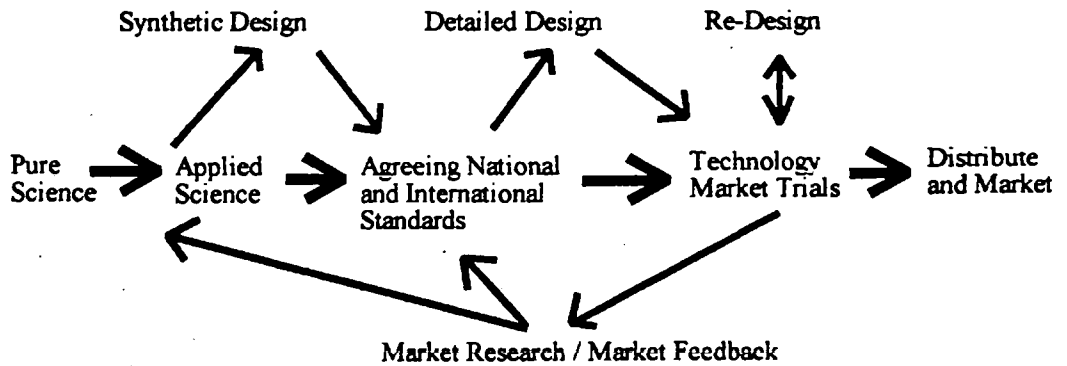
**Source: G Boxall, Open University**

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Each group should not be regarded in isolation, since successful innovation depends on interactions between them. The thesis has focused on the process of innovation generally and on the pressures leading towards smart card innovation in particular. The innovation processes cannot be described as a single linear process. Many aspects are involved in developing and introducing a new bank card technology, from the development of a technology through to marketing the finished bank card to the consumer and retailer. Ideas are developed at all points throughout the development chain, suggesting a correlation with the chain-linked model of innovation described by Kline (1989). Kline emphasises the need for a highly interactive model with new ideas being developed through the innovation. The chain-linked model illustrates how the relationship between the basic research (a pure science) and commercialisation (marketing to the end-user) is too complex to be understood as a straight-line relationship. The process cannot be divided into distinct stages and instead has feedback loops throughout the entire process. Figure 10.2 takes the groups

identified in this thesis and suggests one possible interaction based on Kline's chain-linked model of innovation.

**Figure 10.2 The Chain Linked Model of Innovation applied to the introduction of a New Bank Card Technology in Retail Banking**



**Source: G Boxall, Open University**

The top half of figure 10.2 illustrates the chain linked model applied to the processes involved throughout the innovation, with feedback at all stages. The lower half takes this process one stage further, by illustrating the active players throughout each stage of the innovation. Feedback through the development process is illustrated by the overlapping of players, with progress being achieved.

Our investigations among technology suppliers, banking organisations and retailers particularly, suggest strongly that smart cards will be adopted as the next major bank card innovation. The retail banking sector is complex with every organisation listed having some influence on the decisions made and standards adopted.

However, EMV is playing an increasingly key role by specifying the bank card standards that will be used for credit and debit cards. Assuming that smart card technology is accepted, the EMV standard will be adopted by the member banks of APACS, followed by probably AMEX, Diners Club and the UK Building Societies. In this case, the work of EMV is very significant, with many senior managers believing that VISA is the most influential organisation of the three. EMV is able to invest heavily in the technological opportunities offered by the smart card, developing ideas within the group as well as using external collaboration. Having had global control over the credit and debit card banking business for more than twenty years, the component companies within EMV have built-up considerable experience and expertise in this field. The technology suppliers are ready with as much advice as EMV needs, because ultimately, they stand to gain a small part of the huge market which will evolve over a period of time within the adopting industry. This thesis suggests that EMV is a key driver of the bank card innovation.

APACS, being the voice of the UK clearing banks is the other key driver and should be quite capable of influencing EMV in one direction or another. APACS is seen as the obvious interface to the retailers, working closely with the British Retail Consortium, who are recognised as the retailers 'union' and voice of opinion within the UK. There does of course need to be a demand for any new innovation to have marketing success. Thus far, there is very little consumer demand for a new bank card technology. So long as the consumer takes considerable care, financial losses due to lost or stolen cards become a liability for the issuing bank with only a limited claim against the consumer. Banking in the UK is free of charge if the account holder stays in credit. It is unlikely that consumers will agree to pay more than a modest fee for a more secure banking system - the consumer research carried out suggests a limit of £10- £20 per year.

Barras (1989) in his 'Reverse Product Cycle' describes the adopting industry and the interaction within EMV exceptionally well.

Not only is each set of conditions changing continuously, but the firms in the adopting sector will tend to have both imperfect information and uncertain expectations about these changes - for example concerning the latest developments of the technology or innovation strategies being pursued by their competitors. Firms within the adopting sector must therefore operate in an uncertain and changing environment, matching the known possibilities of the available technology with their perception of evolving needs and demands within their product markets, at the same time taking account of the actions and market positions of competitors, and the opportunities and constraints presented by the changing institutional context in which their industry is operating'. (1989, p224).

De-regulation, the equilibrium between collaboration and competition and the prime objective of being first were all occurring within the adopting industry during the 1990s. As Barras implies in his model, 'firms are having to operate in an uncertain and changing environment'.

Every organisation, including the technology suppliers, financials and retailers, is trying to achieve technological advantage over its competitors. This involves some degree of collaboration as well as direct competition, to maintain industry standards and to ensure that the overall approach is common. To be successful, an holistic view must be taken, otherwise, as one industry expert suggests, 'you will end up with a very expensive white elephant' and no long-term prospects.

The electronic purse based on smart cards is likely to compete with debit cards, with most organisations producing their own standards before the end of 1996. Here again, we are already observing specific evidence of the reverse product cycle described by Barras. Mondex is a result of the Byte Project, itself a closed system operating in one location. The Mondex scheme was initially a trial which received limited media coverage and was described at the time as nothing new. In fact, four years on it turned out to become Mondex, the most significant trial in the UK and a possible turning point for smart card innovation in the UK. Substantial press coverage and industry interest has shown the keenness to appreciate the progress of Mondex, and the competition are prepared to learn from their mistakes. The concept of Mondex has already led to more incremental innovations by competing organisations such as VISA and Mastercard with similar electronic purse

schemes being developed. Barclays Bank and Lloyds Bank are also developing pilot schemes, probably as a reaction to Mondex though they deny this. Whilst these new electronic purse schemes will not be introduced into the UK until 1996, and will operate with different protocol standards to Mondex, this first generation of smart card retail bank cards will be improved in efficiency, quality and general operability by the time the second generation of card is introduced. It was only back in 1987 that Mastercard and VISA carried out their own internal appraisal of smart card technology with the official statement from a VISA spokesperson being

'There is not now a sufficient business case to justify rapid, total replacement of our infrastructure with smart cards'. Clough (1994)

Probably as a direct result of Mondex and other schemes being prepared for the second half of the 1990's, VISA did a total U-turn, endorsing smart card technology as the only way forward. Despite the fact that smart card technology alone does not offer the ultimate security needed for this application, it still seems to have made it to the top of the innovators 'shopping list'. Optical card is too costly and untested for retail banking, and Holomagnetics and X-Sec are too new to be trusted. Watermark magnetics and Photo-ID cards are old technology and will have to be replaced within ten years.

Smart Cards are not a universal panacea. Some experts suggest that we are following the French with their technology-led national introduction of 'smart' bank cards during the late 1980's. These were specifically designed to reduce bank card fraud. By early 1994, it was clear that the economic case was not as attractive as assumed in the 1985 projections. Smart cards are failing too quickly, cost more than expected (about £4) and only reduce bank card fraud by a minimal amount. There is one aspect which still raises doubts - the magnetic stripe has still been retained on French bank cards, compelling fraudsters to travel overseas to defraud the French banks. Smart cards have other potential problems.

Clough (1994) makes his prediction, that

'Smart cards are destined to cause far more problems, even than ATMs because they break the golden rule of computing; always take a backup copy'.

Almost every significant financial organisation is now looking at ways of achieving marketing advantage. This may be achieved by being one of the first to market (as in Mondex, for example) or by launching a product at a later date, with more radical services for the consumer or retailer to choose from - a bank card customer loyalty scheme or multi-function card for example. This suggests why the smart card may be successful. It has a reasonable data capacity, offers better security than the magnetic stripe and can be used to sell and enhance new services. At a time when the banks and building societies are desperate to find something new, the smart card has some advantages.

The banks are convinced that new bank card technology cannot be introduced successfully without collaboration with the retailers. The retailers regularly remind the banking organisations and technology suppliers that the EFTPoS'UK scenario must not be repeated. This effectively makes the retailers an increasingly influential group within the adopting industry, probably more than EMV or APACS would care to admit. Retailers do not want to lose customers as a result of EFTPoS schemes letting them down and will therefore delay the adoption of a new technology until proven. Larger retailers seem to have the trump card in this respect, with the smaller retailers forced into accepting the final decisions taken, with few time constraints.

Many retailers and consumers believe that the cashless society is a myth. Over 30% of the UK population is unbankable and retailers will not pay more for EFTPoS terminals just to accept smart cards. In the grocery market, retailers are reacting to, rather than suggesting ideas, and are not prepared to commit large capital resources to new EFTPoS terminals without good cause. With on-line authorisation and carefully maintained floor limits, financial losses due to bank card fraud are relatively small and there are more important targets for investment such as reducing losses due to shop-lifting and staff pilfering. Schemes like Mondex have the support of the larger retailers, although at no cost to themselves. According to APACS, the consumer will have the final decision on new bank card technology. As suggested by the chain-linked model of innovation, the organisations behind the technology trials will have to listen to consumers. There may be some additional cost to the consumer. Therefore, the banks and building societies will have to give something back. This idea is supported by AMEX who would like to see the introduction of bank card charges, with added benefits for the consumer. The industry will have think hard about the interface between new smart card technology and existing



magnetic stripe systems. The technology supply industry must listen carefully to the market, and work with the banking organisation and retailers if there is to be a smooth transition.

# **Appendix I**

**Bank Card Technology Supplier Survey**

**EFTPoS Consumer Survey**

**Retailer Survey (Interview Questions)**

## **BANK CARD TECHNOLOGY SURVEY**

**Thank you for completing this survey.**

The information supplied will be handled with care and no reference to you by name or to your organisation or company will be made in the resulting observations.

If you decide not to complete this document, I would be grateful if you could return it in the pre-paid envelope, having completed just your company name so that a full statistical audit can be made.

Please return the completed document to:  
**BANK CARD TECHNOLOGY, FREEPOST BR1558, Henfield, West Sussex BN5 9BR**  
using the FREEPOST envelope supplied.

Thank you for your help.

Q1. Company Name (A)

Your Name

Job Title

Q2. Which of the following types of PLASTIC CARD does your Company manufacture/process in-house on a regular basis?

(Circle YES or NO for each card technology)

Low coercivity Magnetic Stripe	YES	NO	(B)
High coercivity Magnetic Stripe (2750 Oe or 4000 Oe)	YES	NO	(C)
High coercivity Magnetic Stripe (Greater than 4000 Oe)	YES	NO	(D)
Watermark Magnetics (TSSI)	YES	NO	(E)
Other Magnetics	YES	NO	(F)
Smart Card (Memory only)	YES	NO	(G)
Smart Card (Memory + Processor)	YES	NO	(H)
Smart Card (Contactless)	YES	NO	(I)
Optical Card	YES	NO	(K)
Other	YES	NO	(L)
Other	YES	NO	(M)

Q3. The process of innovation is dependent upon the 'Technology Push, Market Pull. equation.

Which organisations do you recognise as having the most influence on new bank card technology and innovations?

ie. Are new technologies trying to find an application (smartcard bank cards) OR has the market demanded anew technology?

Comment \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Q4. Do you currently manufacture/process any UK bank cards?  
(During the last 12 months)

YES NO

Q5. Do you currently manufacture/process any other European bank cards? (during the past 12 months) YES NO (M)

Using which technology/ies? \_\_\_\_\_  
(Mag. stripe, Smartcard etc.,)

Do you currently manufacture/process any other countries (non European) bank cards? (during the past 12 months) YES NO (N)

Using which technology/ies? \_\_\_\_\_  
(Mag. stripe, Smartcard etc.,)

Q6. Referring to the list in QUESTION TWO.  
Do you intend to start manufacturing/supporting any of the card technologies which are not supported by your company at the current time?

Which technologies, when and why?

Please Comment Further \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Q7. Do you supply any of the following services to banking organisations of their subsidiaries?

Software Development	YES	NO	(O)
Firmware Development	YES	NO	(P)
Hardware Development	YES	NO	(Q)
Bank Card Bureau Services	YES	NO	(R)

Q8. Do you supply any of the following services to retailing organisations or their subsidiaries?

Software Development	YES	NO	(S)
Firmware Development	YES	NO	(T)
Hardware Development	YES	NO	(U)
Store Card Bureau Services	YES	NO	(V)

Q9. There is currently much publicity about the increasing problem of bank card fraud - about £200 million in 1992. With all the other losses (bad debts etc.,) accounted for by the banks during the past 2 - 3 years, do you believe the banks are really concerned about the growth of card fraud?

YES NO (W)

Comment \_\_\_\_\_

Q10. There a number of key groups or organisations who all contribute to the argument 'should the magnetic stripe bank card be replaced with a different card technology'. Which has the greatest influence/input into this debate and the choice of technology adopted?

Place in order of influence by numbering 1 - 10, where 1 is more influential and 10 is less influential.

- |   |                          |   |      |
|---|--------------------------|---|------|
| Four main UK clearing banks               | <input type="checkbox"/> |   | (X)  |
| Other UK clearing banks                   | <input type="checkbox"/> |   | (Y)  |
| Building Societies                        | <input type="checkbox"/> | N | (Z)  |
| VISA and/or Mastercard                    | <input type="checkbox"/> | u | (AA) |
| Retailers                                 | <input type="checkbox"/> | m | (AB) |
| Consumers / Account Holders               | <input type="checkbox"/> | b | (AC) |
| Card Manufacturers / Technology Suppliers | <input type="checkbox"/> | e | (AD) |
| The Government                            | <input type="checkbox"/> | r | (AE) |
| Media / Consumer Organisations            | <input type="checkbox"/> | l | (AF) |
| 'Progress' in other Countries             | <input type="checkbox"/> | 0 | (AG) |

Any others not listed above, who you believe should be considered.

Comment \_\_\_\_\_

'Current magnetic stripe technology has security and data storage capacity limitations and bank cards should adopt a new technology in the 1990's.

Do you agree with this comment? \_\_\_\_\_

Q11. Some organisations agree and some disagree with the statement. Surely the problem of bank card fraud lies with the banks and retailers use of magnetic stripe cards. Sending cards by Recorded Delivery and better retailer training is all that is required. There is also plenty of storage capacity on a magnetic stripe for banking applications ..... Why change - there is no need?!

Comment \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Q12. The use of a PIN and perhaps a photograph of the card holder on the back of the card is all that is needed. it is cheaper, relatively simple to introduce and uses known technology.

Do you agree? YES NO (AH)

For this reason, other technologies (eg. smartcards) will not be introduced for some time .

Do you agree? YES NO (AI)

If not, please explain further \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Q13. There are a number of card technologies currently being considered for financial bank card use - these are listed over the next page.

Which of these technologies does the technical staff of your company understand? Which does your company believe to be best suited for bank card use (select only one)? and which do you think will actually be adopted in future years (select only one) and approximately by when for UK nationwide use?

Tick all that apply

Tick one box only for each

UNDERSTAND

BEST SUITED

ADOPTED

Magnetic Stripe (no change from today) .....	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1 (AJ)
Magnetic Stripe (with PIN keypad at PoS) .....	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
Magnetic Stripe (with photograph on card) .....	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
Optical Card Technology .....	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
Watermark Magnetics .....	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
Holomagnetics .....	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
EPROM (Memory only) .....	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
EEPROM (Memory + Processor) .....	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1

Other \_\_\_\_\_

Nationwide introduction in which year? \_\_\_\_\_ (AK)

Q14. Various biometrics are discussed for bank card use. Which form of biometrics (if any) is best suited for this application?

\_\_\_\_\_

Q15. Other research reports have indicated that the introduction of new technology is central in the competition between financial institutions. But, the major concerns held by the banks are the cost of updating existing technology and the agreement of standards.

Which organisation has the most influence on bank card technology standards?

\_\_\_\_\_

A long term argument is 'Who should pay for the cost in switching over to a new bank card technology?'

The financial organisation, the retailer, the card holder or consumer through higher bank charges. Government funding or reductions in card costs a part of a long term investment by the technology suppliers.

Who do you think should cover a majority of the cost?

\_\_\_\_\_

\_\_\_\_\_



Q16. Should a new bank card technology require Government Approval - with respect to the Data Protection Act for example? YES NO (AL)

Comment \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Q17. How much do you think we learn from the actions of our European partners? As a country (the UK) do you think we tend too often to allow other countries test a theory and then if it works, follow on behind? For example, every bank card in France uses smartcard technology. Sweden has adopted watermark magnetics .....

.... Or are we just more cautious and plan our long term strategy with more care?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Q18. Do you think the recent recession is partly responsible for us taking more time to review the future of bank card technology?

\_\_\_\_\_  
\_\_\_\_\_

Q19. Many smartcard manufacturers promote the capacity of a smartcard memory and how it can be used for secondary services etc. Is this capacity really needed in retail banking? Surely it is just each manufacturer trying to secure technological and market leadership?

Comment \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Q20. When considering each possible future card technology, which factors are the most important, as you see recognised by the number '1' group you selected in question ten?

See list overpage - Place in order of importance, 1 for more important and 7 for less important.

- |   |                          |      |
|---|--------------------------|------|
| Availability for adding secondary services, loyalty schemes etc., (ie. capacity and processing power) | <input type="checkbox"/> | (AM) |
| Protection against fraudulent use   | <input type="checkbox"/> | (AN) |
| Cost of card / Card Technology  | <input type="checkbox"/> | (AO) |
| Method for issuing card   | <input type="checkbox"/> | (AP) |
| Cost of hardware / upgrading and interfacing with existing system hardware                            | <input type="checkbox"/> | (AQ) |
| Expected life of card and ease of replacement   | <input type="checkbox"/> | (AR) |
| Durability of card technology   | <input type="checkbox"/> | (AS) |
| Other factor _____  |                          | (AT) |
| Other factor _____  |                          | (AU) |

Q21. Please express any other particular views not already indicated above (continue overpage if necessary).

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Thank you for your assistance in completing this document.

A brief summary of some of the statistical data may be produced from this survey, subject to Open University approval, which will only be made available to participants.

If you would like a copy of the summary of observations resulting from this survey, please state address below:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ Postcode \_\_\_\_\_

Thank you for taking part in this survey. Please return this complete document using the FREEPOST envelope supplied - no stamp is required.

**BANK CARD TECHNOLOGY SURVEY, FREEPOST, BR1558, Henfield, West Sussex BN5 9BR**

## **EFTPoS CONSUMER SURVEY**

**Thank you for completing this Questionnaire.**

**All completed Questionnaires are Confidential, no data will be made available to any independent organisation. Neither the Questionnaire nor the envelope is marked in any way that will allow us to identify you personally.**

**The term 'Debit Card' refers to any card which is a member of SWITCH, DELTA, a Barclays Connect Card or a Lloyds Payment Card. When paying by 'Debit Card' you do not use a cheque book - the till operator swipes your card through a reader and you sign the receipt produced. The transaction then appears on your bank statement in the same way as a cashpoint withdrawal. A Debit Card does not offer a period of free credit in the same way as a Credit Card.**

**If possible, please could the person in your household who normally pays for groceries in your 'regular' shopping trip complete this questionnaire.**

**All questions require an answer - although, if you do NOT understand a question, please leave it blank.**

**Please return the complete document to:  
'EFTPoS CONSUMER SURVEY, FREEPOST BRI 558, Henfield, West Sussex BN5 9BR'  
using the FREEPOST envelope supplied - thank you for your help.**

Q1. In which county do you live now? (A)

Q2. Please state your current occupation, age and sex. If applicable, the same details for your partner or spouse.

Your Self (B) Age (C) Sex (D)

Your Partner (E) Age (F) Sex (G)

Q3. Please identify the total amount of Basic Gross Income for yourself and your spouse added together. Tick only one box. (H)

Under £5,000  1 £5,001 - £10,000  2

£10,000 - £15,000  3 £15,001 - £20,00  4

£20,001 - £30,000  5 £30,001 - £40,000  6

More than £40,000  7

Q4. In terms of the amount of money spent, from where do you purchase most of your food/general groceries shopping?

Please indicate your first and second store with one tick in each column shown below. Your 'First Store' will often be referred to in the questions that follow.

First Store (I)

Second Store (J)

Asda .....  1

1

Budgens .....  2

2

Co-op .....  3

3

Gateway .....  4

4

Happy Shopper .....  5

5

Marks and Spencer .....  6

6

Safeway .....  7

7

Sainsburys .....  8

8

Spar .....  9

9

Tesco .....  A

A

Waitrose .....  B

B

Other Store/Market etc.  C

C

Q5. How often, on average, do you visit your 'First Store' chosen in Question 4 above? Tick only one box. (K)

Every Day  1      Every 2 - 3 days  2

Every Month  3      Every 2 Weeks  4

Once a Month  5      Other  6

Q6. What is the average amount of money you spend at your 'First Store' each time you visit? (L)

£ \_\_\_\_\_

Q7. Do you have a Bank and/or Building Society Current Account?

If 'YES' with which Bank or Building Society is your personal account with? \_\_\_\_\_ (M)

Q8. Which of the following do you have?

(Please tick all that apply, for example, your Cheque Card may be used as a Cheque Guarantee Card, Cashpoint Card and SWITCH Debit Card)

Cheque Book  (N)      DELTA Debit Card  (T)

Cheque Card  (O)      VISA and/or ACCESS  (U)

Cashpoint Card  (P)      Diners Club  (V)

SWITCH Card  (Q)      American Express  (W)

Barclays Connect  (R)      Store Charge Card(s)  (X)

Lloyds Payment Card  (S)

Q9. What is your most common method of payment, for groceries purchased at your 'First Store' chosen in Question 4? (Y)

Cheque  (1)      DELTA Debit Card  (6)

Cash  (2)      VISA and/or ACCESS  (7)

SWITCH Card  (3)      Store Charge Card  (8)

Barclays Connect  (4)      American Express  (9)

Lloyds Payment Card  (5)      Diners Club  (A)

Q.10 What is your most common method for paying for petrol/diesel fuel when you visit a garage?

(Z)

- |                     |                            |                    |                            |
|---------------------|----------------------------|--------------------|----------------------------|
| Cheque              | <input type="checkbox"/> 1 | DELTA Debit Card   | <input type="checkbox"/> 6 |
| Cash                | <input type="checkbox"/> 2 | VISA and/or ACCESS | <input type="checkbox"/> 7 |
| SWITCH Card         | <input type="checkbox"/> 3 | Store charge card  | <input type="checkbox"/> 8 |
| Barclays Connect    | <input type="checkbox"/> 4 | American Express   | <input type="checkbox"/> 9 |
| Lloyds Payment Card | <input type="checkbox"/> 5 | Diners Club        | <input type="checkbox"/> A |
|                     |                            | I do NOT drive     | <input type="checkbox"/> B |

In Question 9, if your response was either Barclays Connect, Lloyds Payment Card, SWITCH or DELTA please continue to Question 11 below, continue to Question 13.

Q.11 You have suggested that your most common method of paying for household groceries is by Debit Card - This question is to identify why you prefer to use a Debit Card.

Please state below, your main two reasons for paying with Debit Card. (i.e., Barclays Connect, Lloyds payment Card, SWITCH or DELTA).

Reasons/Advantage 1 \_\_\_\_\_)

Reasons/Advantage 2 \_\_\_\_\_)

Q.12 Please indicate your views to the comments below, by selecting how much you agree or disagree with each one. If you do not understand the statement, leave the answer blank.

	Agree Strongly	Neither Agree or Disagree			Disagree Strongly	
Using a Debit Card is quicker than other means of payment.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AA)
I usually ask for a cash advance when I pay using my Debit Card.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AB)
I am concerned that payments I Have NOT made may appear on my account.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AC)

**Agree Strongly**

**Neither Agree  
or Disagree**

**Disagree Strongly**

It's tempting to overspend with a Debit Card.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AD)
It is difficult to keep track of my spending with a Debit Card	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AE)
Cheques take about 3-5 days to clear my account. A Debit Card transaction will clear my account in less time.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AF)
I HAVE experience at least one unauthorised transfer in the last three years, by Cashpoint or Debit Card.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AG)
On average, I use a Cashpoint once a week.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AH)
I believe the risk of fraud is greater with a Debit Card than with other methods of payment.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AI)
I usually keep the Debit Card payment vouchers for checking with my bank statement.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AJ)
I reconcile my current account on a regular basis checking all or most of my transactions.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AK)
In future, I will probably continue to use a Debit card for groceries.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AL)
If possible, I would use a Debit Card for some of my other purchases.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AM)

**NOW CONTINUE TO QUESTION 16**

Q.13

You have suggested that you prefer NOT to use a Debit Card when paying for household groceries - This question is to identify why you do NOT use a Debit Card.

Please state below, your main two reasons for paying for groceries using the method highlighted in Question 9 above.

(Reason/Advantage 1 \_\_\_\_\_)

(Reason/Advantage 2 \_\_\_\_\_)

Please state below, your main two reasons for NOT using a Debit Card to pay for your groceries.

Reason/Disadvantage 1 \_\_\_\_\_)

Reason/Disadvantage 2 \_\_\_\_\_)

Q.14

Please indicate your views to the statements below, by selecting how much you agree or disagree with each one - tick one box for each statement. If you do not understand the statement, leave the answer blank.

	Agree Strongly	Neither Agree or Disagree			Disagree Strongly	
I do NOT have a Debit Card	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AN)
Without checking my wallet or purse, I do NOT know if I have a Debit Card.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AO)
I have NEVER used a Debit Card before as a means of payment for anything.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AP)
I believe that using a Debit Card is quicker than other methods of paying.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AQ)
I do NOT understand how payment is made with a Debit Card.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AR)
My 'First Store' does NOT accept Debit Cards as a means of payment.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AS)



**Agree Strongly**

**Neither Agree  
or Disagree**

**Disagree Strongly**

I can NOT see any advantage for myself by paying with a Debit Card.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AT)
If I pay for groceries, with a Debit Card, there is an advantage for the Store.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AU)
If I pay for groceries with a Debit Card, there is an advantage for the Bank or Building Society.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AV)
My usual means of paying for the groceries is by cheque.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AW)
My usual means of paying for groceries is by Credit card for extended credit.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AX)
Fraudulent use of my Debit Card is a concern.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AY)
I am concerned that payments which I have NOT made may accidentally appear on my account.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(AZ)
I HAVE experienced at least one unauthorised transfer during the last three years by Cashpoint or Debit Card.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(BA)
When using a Debit card. it is tempting to overspend.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(BB)
It is more difficult to keep track of my spending when using a Debit Card.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(BD)



**QUESTION 16 STARTS NOW.**  
Please read the passage of text that follows, overpage.

**Then answer the following questions, which  
are asked to identify your opinions about possible  
future payments technologies.**

Q.16 Do you understand the text in principle? (BI)

Yes  1                      No  2

Q.17 Thinking about the next few years, do you expect to be using the following methods of payment on a general basis. More, Less or to the Same extent as today.

	More	Less	The Same	
Cash	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(BJ)
Cheques	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(BK)
Debit Card	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(BL)
Credit Card	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	(BM)

Q.18 Do you object to the current practice of some banks charging an annual fee for a credit card? Tick only one box.

- I do NOT use a credit card/s for my personal finances. (BN)
- YES, and I no longer use credit cards for this reason. (BO)
- YES, but I still use credit card/s. (BP)
- NO, and I still use credit card/s. (BQ)

Q.19 Do you think you would find the facility of a financial transaction database on the card useful? Tick only one box.

- |            |                               |                |                               |
|------------|-------------------------------|----------------|-------------------------------|
| Yes, often | <input type="checkbox"/> (BR) | Yes, sometimes | <input type="checkbox"/> (BS) |
| Not really | <input type="checkbox"/> (BT) | No, not at all | <input type="checkbox"/> (BU) |

Most of today's financial cards are single function cards, typically a Cheque Guarantee Card, Credit or Debit Card which offers the cardholder a relatively simple method of cashless payment. Of all the financial cards available, the Debit card offers many advantages. Transactions are quick to process, and there is minimal involvement by the cardholder. Why change to another technology?

Advances in micro-technology have resulted in the *Smartcard*, a multi-functional plastic card that contains a silicon micro-chip and offers many services in one card and greater protection against fraudulent use. The *Smartcard* has its own memory with a larger capacity than a magnetic stripe. In 1990, losses due to card fraud were almost £100 Million. The most common fraud is known as 'card intercept fraud' in which the card is intercepted or stolen before the true cardholder receives it from the card issuer, together with the PIN (Personal Identification Number).

Banks and Building Societies are becoming more concerned about the steady increase in card fraud and recognise that they need to somehow slow this rate down. Many ideas are under review including the introduction of a photograph on each card, educating the retailer to recognise stolen cards more easily and the use of new technology altogether, such as the Smartcard - probably the most serious considered in recent years. But what does the Smartcard have to offer?

Increased security is a major advantage of the *Smartcard*. Users choose their own PIN making it easier for them to remember. The card is taken into the Bank or Building society where the card is programmed with the chosen PIN - this should substantially reduce card intercept fraud. A further advance is now under trial - the cardholder's signature is no longer written on the back of the card, but is stored within the card's electronic signature comparison is carried out every time the card is used for a financial transaction. It is impossible to copy the data stored on the card, as the unique serial number needs to be entered and is only available from the card issuer. This provides a virtually 100% secure, cashless payment system.

The majority of magnetic card transaction enquiries usually relate to a period dating back up to two months. a visit to the bank is usually necessary to pass the security checks to gain access to the correct data. The *Smartcard* is more advanced. It is able to retain the last 50 transaction within the card's memory - the cardholder can then view the stored transaction list using a cashpoint machine at any time. A list of Standing Orders and Direct Debits may also be obtained using a cashpoint machine and if required, changes instantly made.

Increasing competition, advances in technology and the effects of deregulation are resulting in the introduction of new services by all financial institutions. The full potential of Smartcard technology will be realised if secondary functions become available - a medical file for access only by the cardholder or authorised personnel when the card is used in specified retailers. The potential range of services is endless, although further R&D is necessary.

The economic argument of the introduction of the Smartcard is relatively simple. Considering the off-line security features built in the card and the additional range of facilities on offer, the cardholder is likely to accept the additional charge for upgrading the technology. The annual account charge is likely to increase, but only to a nominal £35 or £40 annual card fee. The financial and retail institutions will cover the cost of introducing new Point of Sale terminals, cashpoint machines and other associated hardware. This of course, is just one idea under review and everyone should benefit.....

Q.20 In the main, who do you think should carry the most responsibility to protect your account against fraud? Place the following in order of responsibility with '3' (more), '2' and '1' (less)

- The financial institution (Bank/Building Society) as the card issuer.  (BV)
- You, as the day-to-day user and holder of the card.  (BW)
- The retailer, as the transaction processor at the Point of Sale.  (BX)

Q.21 Rate the following statements using '3' Agree More '2' and '1' Agree Less by how much you believe they predict your attitudes towards the banks/building societies introducing new innovations. Please use each rating only once.

'.....you are happy to accept new innovations which offer better protection against fraud and provide you with more banking facilities. You appreciate that as the account-user, you will probably pay higher bank charges.'  (BY)

'.....you are happy to accept new innovations which offer better protection against fraud and provide you with better banking facilities, although you are reluctant to pay higher bank charges.'  (BZ)

'.....the bank should provide better protection against fraud and provide you with better banking facilities free of charge in order to keep you as their customer.'  (CA)

Q.22 Bearing in mind the extra FACILITIES available on a Smartcard, how much would you be willing to pay as a maximum annual 'Card Fee'?

£NONE  £15  £20  £25  £30  £MORE  (CB)

Q.23 Bearing in mind the extra SECURITY that a Smartcard offers, how much would you be willing to pay as a maximum annual 'Card Fee'?

£NONE  £15  £20  £25  £30  £MORE  (CC)

Q.24 Do you have a computer at home? Yes  1 No  0 (CD)

If YES, which of the following applications do you use (please tick all that apply)? (CE)

Games  G Wordprocessing  W

Accounts  A Education  E

Database and/or Spreadsheets  D Communications (Modem)  C

**Q.25** How do you regard the latest proposals by some banks, to introduce a photograph of the cardholder on the front/back of a cheque card? Please tick one box only.

- A good idea which I support in full. (CF)
- I agree in principle although have some reservations about its protection against card fraud. (CG)
- I do NOT agree in principle and would not welcome this happening to my own bank card. (CH)
- I do NOT know enough about these proposals to be able to comment. (CI)

**Q.26** When generally considering your bank or building society current account (your main household/personal account), how satisfied are you with the following features?

Agree Strongly       Neither Agree or Disagree       Disagree Strongly

- |  | <input type="checkbox"/> 5 | <input type="checkbox"/> 4 | <input type="checkbox"/> 3 | <input type="checkbox"/> 2 | <input type="checkbox"/> 1 |      |
|--|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------|
| The range of services available within the branch where your account is held.                          | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | (CJ) |
| The responsiveness of your branch to respond to your needs.  | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | (CK) |
| Keeping you updated with new accounts and blank services.  | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | (CL) |
| The cost of bank charges, bearing in mind your financial circumstances                                 | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | (CM) |
| Their willingness to compete with other banks and building societies to keep you as a valued customer. | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | (CN) |

**Q.27** Any other comments? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Thankyou for taking part in this survey. Please return this complete document using the FREEPOST envelope supplied - no stamp is required.**

**RETAILER SURVEY**  
**(Interview Questions)**

Q1. Which methods of payment do you accept at the PoS?  
prompt if necessary - cash, cheque, debit, credit (VISA, MASTERCARD), Amex. Diners Club, own card or a/c, other.

Q2. Which are the three most common methods?

Q3. Have you heard of MONDEX?

Have you heard of the

SMART CARD?  
WATERMARK MAGNETICS?  
OPTICAL CARD?  
XSEC SECURITY?  
HOLOMAGNETICS?  
SIGNATURE BIOMETRICS?  
FINGERPRINT BIOMETRICS?

What is PoS?

What is EFTPoS?

What is a Bank Card PIN?

Who is APACS?

Do you know the difference between a credit card and debit card?

Q4. Who should take the most responsibility for protecting a bank account against fraud? (most/least).

Consumer

Bank

Retailer

Q5. Place these five factors in order of importance for the consumer as recognised by you the retailer.

FRIENDLY STAFF

FAST CHECKOUT

PRODUCT RANGE

PRODUCT LAYOUT

LOW PRICES

OTHER



Q6. Have you seen an increase or decrease in the use of plastic cards during the last 2 - 3 years?

What explains this trend?

Q7. In terms of fraud against you as a retailer - have you experienced more fraud through:

Cheques  Counterfeit Cash  Plastic Cards   
Shoplifting  Other \_\_\_\_\_

Q8. Various banks and building societies are evaluating a new bank card technology. Should this new card be introduced, if it helps to protect you the retailer against bank card fraud, are you willing to contribute towards the cost of changing your in-store hardware?

Q9. Have you seen any bank cards with photographs on?

There are both supporters and critics of this system - what is your view?

Q10. How much do you pay for your EFTPoS terminal?

Monthly/Quarterly £ \_\_\_\_\_ Per Transaction \_\_\_\_\_

Q11. Overall, are you pleased with the range of services provided by your bank?

Overall, do you trust your bank?

Q12. Who do you believe has the MOST influence in new bank card technology in this country?

VISA            MASTERCARD            LARGE RETAILERS            APACS  
SMALL RETAILERS            BANKS            MEDIA            BUILDING SOCIETIES  
CONSUMERS            GOVERNMENT            OTHER COUNTRIES

Q13. Who do you believe has the LEAST influence in new bank card technology in this country?

VISA            MASTERCARD            LARGE RETAILERS            APACS  
SMALL RETAILERS            BANKS            MEDIA            BUILDING SOCIETIES  
CONSUMERS            GOVERNMENT            OTHER COUNTRIES

Q14. Which retail marketing/technology publications do you read?

Q15. *'Consumers Claim to be Ready for Electronic Cash?!'*

Do you agree with this comment?

Why / Why NOT?

Q16. Do you currently operate any type of customer loyalty scheme?

Q17. Do you believe we should have a National ID card?

Why?

Q18. Who is proactive in deciding on when and how to upgrade PoS hardware?  
ie. shop owner, head office, PoS hardware sales department, bank

Q19. Have you ever been approached by anyone claiming to have a stolen card suggesting that he/she will divide the proceeds if you accept it?

Q20. How long have you been in business? \_\_\_\_\_ yrs \_\_\_\_\_ mths

Q21. Any other comments:

Name of Retailer: \_\_\_\_\_

Type \_\_\_\_\_ Town: \_\_\_\_\_

Position: \_\_\_\_\_

**G. J. Boxall**  
**Open University / June 1995**

VISA

MASTERCARD

LARGE RETAILERS

APACS

BANKS

SMALL RETAILERS

THE MEDIA

GOVERNMENT

BUILDING SOCIETIES

CONSUMERS

OTHER COUNTRIES

FRIENDLY STAFF

FAST CHECKOUT

PRODUCT RANGE

PRODUCT LAYOUT

LOW PRICES

OTHER

CHEQUES

COUNTERFIET CASH

PLASTIC CARDS (DEBIT AND CREDIT  
ETC.,)

SHOPLIFTING

IN-HOUSE FRAUD

OTHER

consumers banks  
retailers

## Appendix II

### List of Interviewees

This thesis is based on interviews with the following managers in these financial organisations.

American Express	G.Cruwys, C.King
APACS	R.Johnson, R.Mabbott
Barclaycard / Barclays Bank	M.Duckworth, R.Townend
Banksys	R.Slinckx
Diners Club International	R.Cash, R.Parker
Europay International	R.Phillimore
Jersey Card	C.Parlett
Mastercard International	R.Townend
Midland Bank	N.Stanley
Mondex UK	D.Walters, T.Surridge, D.Everett
National & Provincial Building	N.Wren
National Westminster Bank	N.Walling, E.Spalding
Save & Prosper	I.Lindsey
TSB aBank	T.Plummer, F.Dawes
The Royal Bank of Scotland	A.Glencorse
VISA International	P.Moran, L.Cooper, B.Howe



**This thesis is based on interviews with the following managers in these retail and consumer related organisations.**

<b>Asda</b>	<b>B.Stephens</b>
<b>Boots The Chemist</b>	<b>T.Morrow</b>
<b>BP Garage</b>	<b>A site Manager</b>
<b>Budgens</b>	<b>P.Randle (store manager), A.Whitehead</b>
<b>Co-operative</b>	<b>A store Ass.Manager</b>
<b>Dillons Newsagents</b>	<b>M.Atkinson</b>
<b>EFTPOS'UK</b>	<b>Various Members</b>
<b>Happy Shopper</b>	<b>A.Berriman</b>
<b>Richard Ironside (independent Grocers)</b>	<b>Owner (independent)</b>
<b>Sainsbury</b>	<b>O.Randell, K.Smallwood, a store manager</b>
<b>Somerfields</b>	<b>A store Manager</b>
<b>Threshers</b>	<b>K.Harmer</b>
<b>Threshers</b>	<b>B.Harvey-Bussell, J.Bridgers</b>
<b>Tesco</b>	<b>E.McCue, G.Dowis</b>
<b>Unichem Pharmacist</b>	<b>A store Pharmacist</b>
<b>West Midlands Police Fraud Squad</b>	<b>D I Johnstone</b>
<b>Woodbourne Avenue Post Office</b>	<b>The owner (independent)</b>
<b>Consumers Association</b>	<b>J.Eglesham, S.Leggate</b>
<b>British Retail Consortium</b>	<b>M.Wilsey</b>
<b>West Midlands Fraud Squad</b>	<b>D I G.Johnson</b>

This thesis is based on a questionnaire which was sent to and received back from the following technology suppliers. Subsequently, some of these suppliers were interviewed by telephone.

AT&T Group	
Barnes International Marketing Ltd	J.Coelho
Bull Information Systems Ltd	
Canon Ltd	
Card Code Ltd	D.Taylor
Casio Electronics Ltd	
Cash Card Ltd	J.Kelly
Control Module Inc.,	
Datacard Ltd	B.Emerson
De La Rue / Delphic Card Systems Ltd	D.Barnes
Drexler & Nippon Conlux Ltd	
Edacom Data Systems Ltd	
Euclid Ltd	G.Neal
GEC Card Technology Ltd	P.Moore
General Information Systems Ltd	R.Banerjee
Hitachi Europe	
IBM Retail Business Ltd	
ICL Retail Systems Ltd	
ID Data Systems Ltd	S.Lord
Independent Technologist	B.Clough
Kenrick & Jefferson Ltd	S.Hodgson, T.Gurd
Lasercard Systems Inc.,	M.Noelle-Cooper
McCorquodale Card Technology Ltd	P.Brook
Motorola Ltd	
National Business Systems Ltd	R.Amiri
OKI Semiconductor Ltd	A.Reed
Olivetti	
Omron Tateisi Electronics Ltd	J.Hutchings, M.Cannon
Riva	
Siemens plc.,	
Smart Card Club	R.Poynder
Thames Estuary Plastics Ltd	G.Wright
Thorn Secure Science International	E.White
US <sup>3</sup>	T.Warbier
West Lamination GmbH	S.West
X-Tec Corporation	J.Jeffries

## **Appendix III**

### **List of Conference Papers Presented**

#### **'Machine-Readable Cards'**

ScanTech'91 Conference  
Messe Dusseldorf, Germany  
Wednesday 16th October 1991

#### **'Documents & Forms:Smart Cards'**

ScanTech'92 Conference  
NEC Birmingham, England  
Thursday 18th June 1992

#### **'Card Technology:Optical Cards'**

ScanTech'92 Conference  
CNIT Paris Le Defense, France  
Thursday 5th November 1992

#### **'Chip Card Acceptor Devices:The Options'**

Smart Card'93 Conference & Exhibition  
Olympia London, England  
Thursday 18th February 1993

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