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Dynamics of Innovation in eBanking

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ABSTRACT

Technology has introduced new ways of delivering banking to the customer, such as ATMs and Internet Banking. Hence, banks have found themselves at the forefront of technology adoption for the past three decades. Banks began to look at e-banking as a means to replace some of their traditional branch functions. e-banking products/services like ATM and electronic funds transfer were a source of differentiation for banks that utilized them. This research paper uses the Revised Technology Adoption Life Cycle model to develop a framework for technology evolution in e-banking.

1. INTRODUCTION

The evolution of the e-banking industry can be traced to the early 1970s. Banks began to look at e-banking as a means to replace some of their traditional branch functions, for two reasons. Firstly, branches were very expensive to set up and maintain due to the large overheads associated with them. Secondly, e-banking products/services like ATM and electronic funds transfer were a source of differentiation for banks that utilized them. Being in a fiercely competitive industry, the ability of banks to differentiate themselves on the basis of price is limited. Technology has introduced new ways

of delivering banking to the customer, such as ATMs and Internet Banking. Hence, banks have found themselves at the forefront of technology adoption for the past three decades. It is imperative for banks to align their strategies in response to changing customers' needs and developments in technology.

Our research aims to fill a gap in the current e-banking literature This paper uses the Revised Technology Adoption Life Cycle model to develop a framework for technology evolution in e-banking. The following section reviews existing literature on dynamic innovation models and technological developments in banking. In Section 3, we argue that a modified version of the model provides a useful blueprint for strategies that constitute success at different stages of a discontinuous technology's evolution. Section 4 validates the model by applying it to two such discontinuous innovations, ATM and Internet Banking. Hypotheses on the next paradigm shift are made in section 5.

2. LITERATURE REVIEW

In trying to find a framework to explain the evolution of e-banking technology, and some of the reasons behind successful implementations of e-banking strategies thus far, four models of technological innovation were reviewed. This section deals with literature on three of these models. The importance of innovation in the banking sector is discussed. Previous studies on technological evolution in the banking industry are also summarized.

2.1. Models of Innovation

Innovation is defined as the use of new knowledge to offer a new product or service that customers want (Afuah, 1998, pp. 13). The new knowledge here refers to technological or market knowledge. Technological knowledge is knowledge of components, linkages between components, methods, processes and techniques that go into a product or service. Market knowledge is knowledge of distribution channels, product applications and customers' expectations, preferences, needs and wants (Afuah, 1998). No matter how the paradigm shifts due to external factors like technology and environment, the process of innovation cannot be separated from a firm's strategic and competitive context.

The Utterback/Abernathy model (1978) was the first attempt at detailing the dynamic processes that take place within an industry and its firms during the evolution of a technology. The model described three phases in an innovation's life cycle – the *fluid*, *transitional* and *specific* phases. In the fluid phase technology is in a state of flux and firms have no clear idea whether, when or where to invest in R&D. Custom designs are common, with the new product technology often crude, expensive and unreliable but able to meet the requirements of some market niches. The evolution then enters the transitional phase when, as producers learn more about how to meet customer demands through producer-customer interaction and through product experimentation, some standardization of components, market needs and product design features takes place. A *dominant design* emerges, signalling a substantial reduction in uncertainty, experimentation and major design changes. The design commands a high percentage of the market share. ATMs represent one such dominant design in the banking industry. In the specific phase, products built around the dominant design proliferate and there is more and more emphasis on process innovation, with product innovations being largely incremental. Cost becomes the basis for competition. The pattern described repeats itself when a new technology with the potential to render the old one obsolete is introduced. This results in a discontinuity, plunging the innovation cycle back to the fluid phase.

The Tushman/Rosenkopf Technology Adoption Life Cycle (1992) is similar to the Utterback/Abernathy model in many aspects. However, it addresses another important and unanswered question in the dynamics of innovation. To what extent can a firm influence the evolution of the innovation? For example, to what extent can a firm guide its design to an industry standard, or *dominant design*? Tushman and Rosenkopf argue that this depends on the amount of technological

uncertainty which in turn, depends on the complexity of the technology and the stage of evolution. The more complex an innovation, the greater is the role of non-technical factors such as complementary assets and organizations in the local environment during the innovation's life cycle. Geoffrey Moore built on Tushman and Rosenkopf's model to come up with the Revised Technology Adoption Life Cycle. The significant value-add of Moore's model is the 'Chasm' concept. The Revised Technology Adoption Life Cycle is described in section 3.

2.2. S Curve

The dynamic models mentioned above state that the evolution of an innovation ends with the arrival of a technological discontinuity. However, it is difficult to predict when this discontinuity will arrive. Foster (1986), argued that the rate of advance of a technology is a function of the amount of effort put into the technology and follows the S curve shown in Figure 1. For a given technology, the evolution is as follows: Initial efforts result in little advancement until the technology becomes successful. This success point, at the lower knee of the curve, is where the technology has finally demonstrated its utility and superiority over the previous technology. After this point significant progress and improvements are made as several embodiments are produced and the technology becomes widely established. Eventually, however, the physical limits of the technology are reached, and continued effort results in little additional advancement. To *go beyond* the limits of the top of a predecessor's S-Curve, a new alternative must be created.

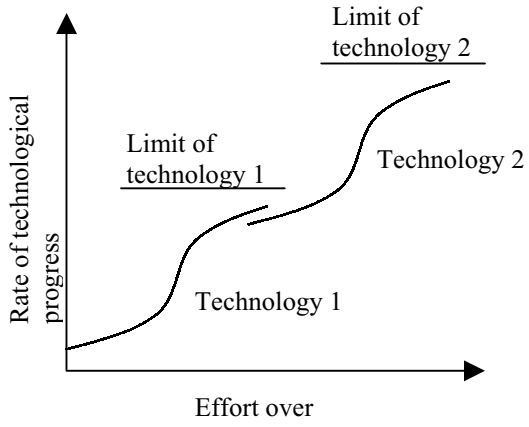

Figure 1: S Curves

Adapted from: Foster, 1986

2.3. Previous studies of technological innovation in banking

The Inverse Product Life Cycle Model (Barras, 1986) was applied to the banking industry by Barras (1990). Barras' model was reversed with respect to Utterback and Abernathy's (1978) model. While this model helps understand the innovation mechanisms of the services industry, it "lends itself to a fundamental criticism, which is manifest when it is applied to the banking industry" (Buzzacchi et al., 1995, pp. 153). Barras' model characterizes all banking innovations as incremental, which is not necessarily correct. The diffusion of network technologies and distributed systems has resulted in radical innovations like ATMs and Internet banking.

Buzzacchi et al. (1995) proposed a model to analyze innovations resulting from the diffusion of Information Technologies in the banking sector. This model built on existing work done by Barras, and the Utterback/Abernathy model. A distinction was made between the 'mass automation' regime and the 'smart automation' regime. Mass automation dealt with mechanization of back office procedures in the 1960s and was a period of incremental innovation, whereas smart automation dealt with the diffusion of network technologies like ATM and was characterized by radical process innovations. The theoretical hypotheses were validated through an econometric analysis of the determinants of innovative behavior in a sample of Italian banks.

3. THE REVISED TECHNOLOGY ADOPTION LIFECYCLE

In trying to explain the changes in the e-banking market as technology evolves, we have built upon Geoffrey Moore's *Revised Technology Adoption Life Cycle*. The Revised Technology Adoption Life Cycle deals with market responses to *discontinuous technological innovations*. 'Truly discontinuous innovations are new products or services that require the end user and the marketplace to dramatically change their past behavior, with the promise of gaining equally dramatic new benefits' (Moore, 1995). When the marketplace is faced with a new technological paradigm, customers can be segmented into five major categories according to their propensity to embrace the new technology. These five segments, in order, are the *Innovators, Visionaries, Pragmatists, Conservatives* and *Skeptics* respectively. The distinct types of customer segments enumerated above form the basis for five different stages of a technology's marketplace, namely, the *Early Market*, the *Bowling Alley*, the *Tornado*, *Main Street* and *End of Life*.

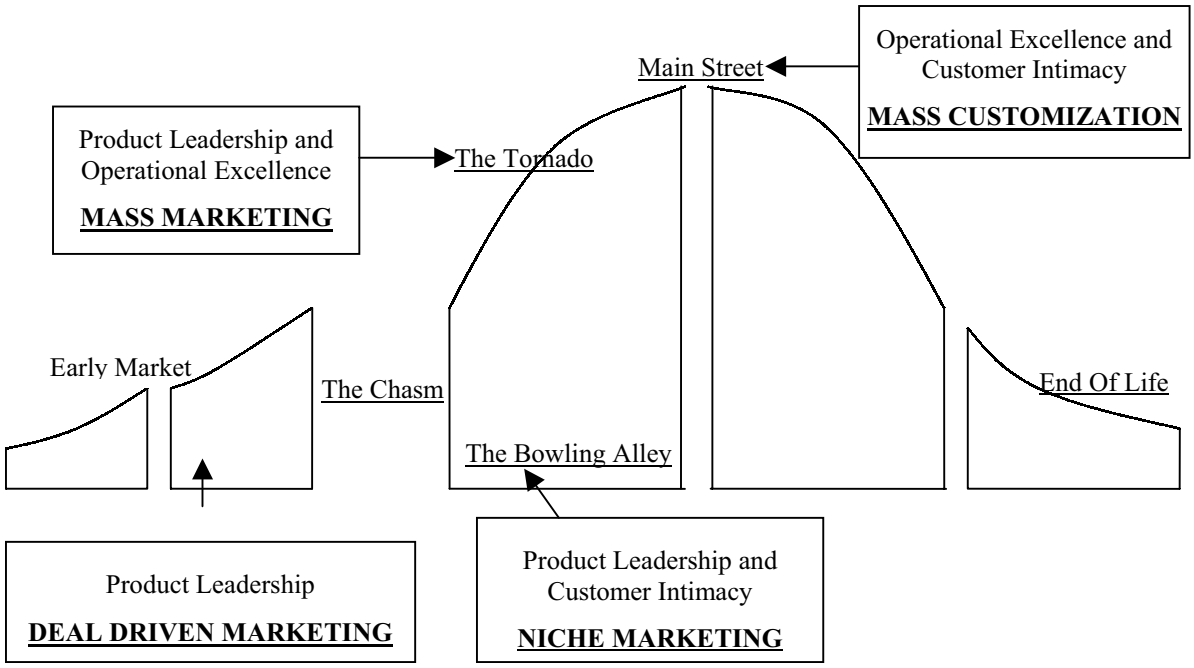

Figure 2: Market strategies have to change as technology matures in the marketplace

A company's product/service strategy depends on the position of its innovation within the Technology Adoption Life Cycle. According to Moore, the different responses of each of the customer segments to a new technology means that companies need to continually change their business strategies to cater to changing market conditions. The strategies that constitute success, according to Moore (1995), at different phases in the Life Cycle are depicted in figure 2 above.

3.1. The 'Chasm' Concept

"Companies often stumble when it comes to making the transition from the visionaries to the pragmatists" (Moore, 2001). Most high technology innovations that manage to gain Early Market support falter beyond this phase, and 'fall into a chasm'. Since most of the revenue from an innovation comes from the pragmatists, who make up the bulk of the mainstream market, crossing the chasm is an organizational imperative. Moore argues that the key to crossing the chasm lies in using the technology to develop a *whole product*, tailored to the needs of a specific market niche.

3.2. Limitations of the Model

1. It is difficult to predict when a technological discontinuity will arrive to displace the old paradigm
2. The model does not provide any information on how a company can successfully make a transition from the old paradigm to the new one

3.3. Modifications Proposed

Our research framework applies Foster's S Curve (Foster, 1986) in order to predict the arrival of a technological discontinuity, which has the potential to displace existing technologies. The S Curve depicts the diminishing returns from a technology as the limits of that technology are reached. It is these diminishing returns that indicate the arrival of a discontinuous technology. The S Curve is mapped to the Revised Technology Adoption Life Cycle as shown in figure 3. It has been argued that the successful transition from the old paradigm to the new one is a function of the type of firm and the innovation in question – whether radical or incremental. A radical innovation differs from an incremental innovation in that the capabilities of a firm (either technological or marketing) are rendered obsolete by the former, whereas the latter builds on existing capabilities. Radical innovations destroy either technological or marketing capabilities or both, whereas incremental innovations are said to be competence enhancing (Tushman et al., 1988).

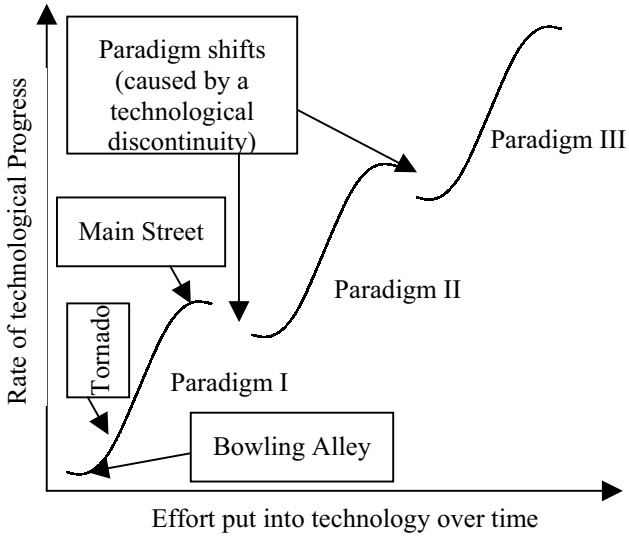

Figure 3: Foster's S Curve mapped to the Life Cycle to predict the arrival of a technological discontinuity

Abernathy and Clark extended the concept of the effect of an innovation on the existing capabilities of a firm as shown in figure 4.

An innovation is *regular* if it conserves the manufacturer's existing technological and market capabilities, *revolutionary* if it is a radical technical innovation but an incremental market innovation, *niche* if it enhances technological capabilities but obsoletes market capabilities and *architectural* if it is both a radical technological and market innovation. Incumbents possessing well established market or technological capabilities or both (that are hard to acquire by new entrants) are most likely to exploit regular, revolutionary and niche inventions. New entrants, on the other hand, have been more successful in exploiting architectural innovations and, to a lesser extent, niche innovations (Abernathy, et al., 1985).

Market Capabilities ↓ / Technical Capabilities →	Enhanced	Destroyed
Enhanced	Regular (Incremental)	Revolutionary
Destroyed	Niche	Architectural (Radical)

Figure 4: Abernathy – Clark terminology

4. VALIDATION OF THE REVISED TECHNOLOGY ADOPTION LIFECYCLE

4.1. The Automated Teller Machine (ATM) Life Cycle

Automated Teller Machines can be considered to be a discontinuous *revolutionary* innovation. ATMs required a bank's customers to dramatically change their behaviors in order to obtain benefits in terms of faster, more convenient banking. Instead of going to a bank branch, filling out a transaction form and interacting with a human teller, these customers could log on to the bank's network and conduct a variety of transactions on a machine. The Technology Adoption Life Cycle can be applied to ATMs in order to understand the business strategies adopted by various banks at different stages of ATM evolution.

Increasing labour costs in the 1960s placed pressure on labour intensive industries like banking to look towards automating some of their functions. Barclays Bank was the first to envisage the potential of ATMs, and introduced the first ever ATM in 1967. Initially, ATMs were not very sophisticated, and served only as cash dispensers. Originally, large banks offering an ATM service achieved an advantage over their competitors (O' Hanlon et al., 1993). There was scant understanding of the customers' needs or expectations and the role of ATMs in banks' retail delivery system was vague (Violano et al., 1992). In the early market stage, the ATM was a product based on a radical technological innovation, and did not represent a solution to a customer need at that point of time. Early adopting banks focused on the technological aspects of ATMs in order to gain leverage among innovators and visionaries.

In order to enable ATM technology to successfully cross the chasm, banks began to focus on specific customer niches. By penetrating into clearly defined market segments, ATMs began to achieve acceptance in these segments. Swinyard and Ghee (1985) found that a successful bank strategy during this phase involved segmenting the customers according to attitudinal variables, and focusing on the requirements of these customers. This study found that ATM cardholders differed from non-cardholders in their attitudes towards change, convenience and technology. The findings have been backed by numerous other studies (Moutinho and Meidan, 1989; Leblanc, 1990; Marr and Prendergast, 1993; Iversen and Rugimbana, 1994; Rugimbana, 1995; Thornton and White, 2001).

By the mid-1970s, features like cash balance enquiry, deposits and funds transfer extended the original cash dispensing functionality to cater to the primary requirement of early ATM cardholders, namely, convenience (O' Hanlon et al., 1993). This permitted these customers to conduct the majority of their routine transactions without visiting a bank branch. By leveraging the acceptance of ATMs within specific customer segments, banks began to 'bowl over' other niches, enabling ATM machines provided by Docutel and NCR to become the *dominant design*. ATMs began to gain widespread acceptance among banks' customers in the late 70s. At this stage most banks began to consider an ATM as a prerequisite for staying in business. Developments in networking technologies also helped reduce the costs of setting up and maintaining ATM networks. By 1983, 40000 ATMs were in operation. The economies of scale necessary for tornado market success were achieved by advances in digital technology and network consolidation among different banks (O' Hanlon et al., 1993).

By the late 1980s, ATMs were viewed as a generic service, a commodity with no competitive advantage. In order to succeed, banks needed to adopt main street strategies like product proliferation and bundling. The advent of shared national networks like Cirrus and Plus (in the U.S.A.) helped proliferate ATMs further. Banks looked to bundle additional functions like bill payments and automatic check cashing in order to differentiate their ATM services. These differentiated services, however, constitute an insignificant percentage of the entire ATM transaction volume. This inability of banks to differentiate their offerings has resulted in limited success on the ATM Main Street. After reaching an apex of 930 million transactions per month in 1998, industry ATM volume slipped to 907 million transactions per month in 1999 (Dove Associates). Dove predicts the compound annual growth rate of ATM transactions over the next couple of years to be 1.3%. Industry analysts claim that a large

reason for this stagnating growth is the saturation of the market. Rising fees per transaction (instituted when Visa and MasterCard dropped their bans on charges in 1996) have deterred many consumers, further trimming transaction growth.

Using Foster's S Curve, it can be argued that stagnating ATM transaction volumes indicates that the physical limits of ATM technology are being reached. This has prompted banks to begin experimenting with other e-banking products and services, notably Internet Banking. However, "retail banking via the Internet has not taken off yet, despite perennial predictions that it is about to" (Orr, 2001). Yet, banks have invested heavily in Internet banking, and the focus is on customizing the entire banking experience online.

4.2. Internet Banking and the Life Cycle

The Internet, much like the ATM that came before it, is fundamentally a new distribution channel over which banks can deliver traditional banking products and services (Young, 2001). Consumers have developed a high degree of comfort for using remote basic banking services, as demonstrated by the rapid proliferation of ATMs since their introduction 30 years ago. Initially, banks promoted their core capabilities, namely, products, channels and advice, through the Internet. Then, they entered the Internet commerce market as providers/distributors of their own products and services (Rubin, 1998). The vast majority of the banks that avoided Internet banking in the beginning did so because they simply did not see the benefits of using it (Sheshunoff, 1999; Slywotzky, 2001).

An extensive study conducted in 2001 by the Consumer Bankers Association indicates that Internet banking usage remained stagnant from 1996 to 1998, with less than 10% of the market utilizing the service. This characterizes the early adoption phase where the banking industry, in its striking transformation, has embarked on an era of 'anytime, anywhere' banking (Polatoglu and Ekin, 2001). Banks that had the capability of implementing such a system became the first movers and focused primarily on the technological benefits offered by such a setup in order to capture technology enthusiasts at that time. Examples include Merrill Lynch, Charles Schwab, Citibank and Bank of Montreal (Holland and Westwood, 2001) that provided services such as cash management, account statements and transaction receipts.

Since then Internet banking has been able to successfully cross the chasm as a complete service within the financial services industry. As mentioned above, technologies in the early market provided many single services and not complete solutions. In Europe, two financial firms stand out for their ability to effectively target customer niches in order to cross the chasm: Marschollek Lautenschlager and Partner (MLP) in Germany and Bankinter in Spain (Slywotzky, 2001). Polatoglu (2001) and Young (2000) have shown instances of niche-based strategies adopted by Garanti, Wells Fargo and Northern Trust during this period. These examples demonstrate the development of a complete service that becomes widely used within a small segment of the pragmatic early majority, representing an entry into the bowling alley.

According to the Gartner Group's 1999 report, there has been a rapid growth in online PC banking in the USA; from just over 10 million in 1999 to the projected 35 million by the year 2003 with a rapid shift to Internet access (Barto, 1999). Consumer growth in some European countries such as Germany, Norway and Sweden has been similar (Bons, 1999; Slywotzky, 2001). With the current proliferation of Internet banking, its life cycle is well set in a tornado with many banks instituting strategies for operational excellence and mass marketing. The economies of scale necessary for tornado market success are being achieved through account aggregation, multi-channel distribution and Internet bill payment and presentment (Cline, 2001).

Banks have begun to differentiate their Internet offerings as basic online banking becomes a commodity, signaling the imminent arrival of main street. Strategies like bundling and whole product offerings targeted at specific +1 niches need to be adopted in order to retain customers in this phase. For example, Bizzed.com (a Citigroup site) has started offering payroll, retirement accounts, office

supply shopping, accounting services and a variety of other services (Altinkemer, 2001). In an attempt to solidify and expand customer relationships and to stay ahead of the competition, banks are turning to the next generation of personalized online services – Internet banking portals and Mobile banking (Fonseca et al, 2001; Saatcioglu, 2001). Early Internet banking portal providers include Chase Manhattan Bank, Citigroup and Wells Fargo. Engen (2000) and Schmerken (2000) argue that as network speeds and devices improve, wireless will become the preferred channel for providing financial services. A July 2000 Forrester Research report stated that 47% of the firms surveyed said that customer retention was the number one reason for adopting wireless. The move by a few banks into providing integrated financial portals (as a bundle of financial services) and mobile banking which is targeted primarily at the higher-end mobile customer base indicate that banks recognize the importance of differentiation of their online banking products.

5. THE NEXT PARADIGM SHIFT?

As Internet and Mobile Banking technology become generic services, a stage of technological discontinuity will prevail again, with a multitude of new technologies and services fighting to become the next paradigm. The most promising of these will be a strategic shift towards a "customer-centric business model". The current state of the financial industry, our modifications of Moore's model and the study of Foster's S Curves for Internet Banking substantiate our hypothesis.

5.1. Current State of the Financial Services Industry

Deregulation – Changes in government regulation of the industry has caused traditional firms to expand their offerings (Llewellyn, 1996). Competition is multiplying as these institutions fight for customers in new arenas.

Disintermediation – Non-traditional entrants are competing with recognized financial institutions. These new players are forming stronger relationships with financial service firms' consumers than the firms themselves are able to form (Daniels, 1999; Holland et al, 2001; Holliday, 2001). For example, programs such as Quicken or Microsoft Investor are accessed more frequently than Citigroup's offering. With equivalent products available from a number of sources, consumers are not induced to frequent one product provider. Thus, firms will lose intimacy with their customers (making it harder to cross-sell), and customers will lose loyalty to their financial service providers (increasing customer acquisition cost). Furthermore, the Internet allows consumers to analyze costs and performance themselves, capturing real-time market data with their own computers. These consumers are thus able to access information and services that were previously mediated by financial service firms.

Wealth Transfer – Over the next ten years, the largest and wealthiest demographic group will begin transferring wealth (Daniels, 1999; Bielski, 2000; Holliday, 2001). Research at Arthur Anderson and Gartner predict that this transfer will be around $41 trillion in assets. In this way, a significant share of each firm's best customers will be leaving them. The customers who will be transferring wealth are, in general, older, brand-loyal customers who have maintained significant amount of money with particular firms for a long time. In many cases, those receiving the money will be younger, less brand-loyal individuals who lack existing financial relationships. Therefore, they are significantly less predictable than the older customer base. The shift between this long-standing customer base and the emerging wealthy is accelerating, and a financial service firm needs to manage this shift properly for its customers.

5.2. Customer-Centricity

The state of the industry requires that organizations rethink their traditional methodologies or risk obsolescence. Financial service firms will need to shift to a customer-centric, rather than a product-

centric business model. They see the profit in forming value-added relationships with their consumers and cross selling new products into those relationships (Wind, 2001). Electronic Customer Relationship Management (eCRM) will thus represent the next paradigm shift. Lemon and Rust (2001) depict that customer expectations of personalization will escalate with the continued enhancement of technological capabilities and that customers will expect to be truly "known" by the firm. eCRM in this sector will not just be about implementing the right technology and software; It will be a matter of fundamental change, involving the re-engineering of processes throughout the financial institution. It must not be a web solution or an advisor solution or a call center solution or a wireless solution. Enterprise-wide eCRM must be all of the above. Beyond the ability to deploy across multiple channels, the solution must have consistency and collaboration across all channels.

The above description represents a new way of looking at the customer where current marketing abilities are rendered potentially obsolete and existing technological capabilities are enhanced. Drawing on our modification of Moore's model and using the Abernathy-Clark terminology as explained in section 3.3, the predicted paradigm shift is a niche innovation. Consequently, incumbents with established technological abilities and, to a lesser extent, new entrants may be most successful in exploiting the opportunities made available by the eCRM innovation. Banks that are able to understand their customers and re-assess their strategies accordingly will be the most successful in the banking environment of the future.

6. CONCLUSION AND SUGGESTIONS FOR FUTURE RESEARCH

Changes in banks' external environment, including globalization and deregulation, have made the banking sector highly competitive. Banks find it hard to compete on price, and need to look at other ways to retain customers. As customers become more sophisticated, it becomes imperative for banks to consider the use of technology to respond to their continuously changing requirements. A number of previous studies have highlighted the importance of technology to a bank's success.

By applying the Revised Technology Life Cycle to two discontinuous e-banking innovations – ATMs and Internet Banking, we have established that the Life Cycle provides a useful outline for successful strategies that can be adopted by banks and other financial institutions as technology evolves. According to the Life Cycle, banks' marketing strategies need to change as the technology matures in the marketplace. Certain limitations of the Life Cycle have also been highlighted, and modifications are proposed. These modifications are, in turn, used as the basis of our hypotheses on the next technological discontinuity.

Our study drew from existing research material in e-banking technology and models of innovation. Future research avenues include validating this study on a set of banks in different geographical regions as a case study, in order to confirm its level of representativeness. In addition, the study could be replicated using other e-banking technologies like EFTPOS, SWIFT or smartcards.

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