

Information Technology Management in Banking

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Abstract

This paper introduces banking technology as a confluence of several disparate disciplines such as finance (including risk management), information technology, computer science, communication technology, and marketing science. It presents the evolution of banking, the tremendous influence of information and communication technologies on banking and its products, the quintessential role played by computer science in fulfilling banks' marketing objective of servicing customers better at less cost and thereby reaping more profits. It also highlights the use of advanced statistics and computer science to measure, mitigate, and manage various risks associated with banks' business with its customers and other banks. The growing influence of customer relationship management and data mining in tackling various marketing-related problems and fraud detection problems in the banking industry is well documented. The paper concludes by saying that the banking technology discipline is all set for rapid growth in the future.

Key Words: *banking technology, information technology, communication, crm, data mining.*

Introduction

The term "banking technology" refers to the use of sophisticated information and communication technologies together with computer science to enable banks to offer better services to its customers in a secure, reliable, and affordable manner, and sustain competitive advantage over other banks. Banking technology also subsumes the activity of using advanced computer algorithms in unraveling the patterns of customer behaviour by sifting through customer details such as demographic, psychographic, and transactional data. This activity, also known as data mining, helps banks achieve their business objectives by solving various marketing problems such as customer segmentation, customer scoring, target marketing, market-basket analysis, cross-sell, up-sell, customer retention by modeling churn, and so forth. Successful use of data mining helps banks achieve significant increase in profits and thereby retain sustainable advantage over their competitors. From a theoretical perspective, banking technology is not a single, stand-alone discipline, but a confluence of several disparate fields such as finance (subsuming risk management), information technology, communication technology, computer science, and marketing science.

Figure 1 depicts the constituents of banking technology. From the functional perspective, banking technology has three important dimensions, as follows:

1. The use of appropriate hardware for conducting business and servicing the customers through various delivery channels and payment systems and the associated software constitutes one dimension of banking technology. The use of computer networks, security algorithms in its transactions, ATM and credit cards, Internet banking, tele banking, and mobile banking are all covered by this dimension. The advances made in information and communication technologies take care of this dimension.
2. On the other hand, the use of advanced computer science algorithms to solve several interesting marketing-related problems such as customer segmentation, customer scoring, target marketing, market-basket analysis, cross-sell, up-sell, and customer retention faced by the banks to reap profits and outperform their competitors constitutes the second dimension of banking technology. This dimension covers the implementation of a data warehouse for banks and conducting data mining studies on customer data.

Figure 1. Different Constituents of Banking Technology in each

Banking Technology links to :

1. Marketing Science
 2. Finance & Risk Management
 3. Information Technology
 4. Computer Science
 5. Communications Technology
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3. Moreover, banks cannot ignore the risks that arise in conducting business with other banks and servicing their customers, otherwise their very existence would be at stake. Thus, the quantification, measurement, mitigation, and management of all the kinds of risks that banks face constitute the third important dimension of banking technology. This dimension covers the process of measuring and managing credit risk, market risk, and operational risk. Thus, in a nutshell, in 'banking technology', 'banking' refers to the economic, financial, commercial, and management aspects of banking, while 'technology' refers to the information and communication technologies, computer science, and risk quantification and measurement aspects.

Evolution of Banking

Despite the enormous changes the banking industry has undergone during the past 20 years—let alone since 1943—one factor has remained the same: the fundamental nature of the need customers have for banking services. However, the framework and paradigm within which these services are delivered has changed out of recognition. It is clear that people's needs have not changed, and neither has

the basic nature of banking services people require. But the way banks meet those needs is completely different today. They are simply striving to provide a service at a profit. Banking had to adjust to the changing needs of societies, where people not only regard a bank account as a right rather than a privilege, but also are aware that their business is valuable to the bank, and if the bank does not look after them, they can take their business elsewhere (Engler & Essinger, 2000).

Indeed, technological and regulatory changes have influenced the banking industry during the past 20 years so much that there are the most important changes to have occurred in the banking industry, apart from the ones directly caused by the changing nature of the society itself. Here technology is used interchangeably with information and communication technologies together with computer science. The relationship between banking and technology is such that nowadays it is almost impossible to think of the former without the latter. Technology is as much part of the banking industry today as a ship's engine is a part of the ship. Thus, like a ship's engine, technology drives the whole thing forward (Engler & Essinger, 2000).

Technology in banking ceased being simply a convenient tool for automating processes. Today banks use technology as a revolutionary means of delivering services to customers by designing new delivery channels and payment systems. For example, in the case of ATMs, people realized that it was a wrong approach to provide the service as an additional convenience for privileged and wealthy customers. It should be offered to the people who find it difficult to visit the bank branch. Further, the cost of delivering the services through these channels is also less. Banks then went on to create collaborative ATM networks to cut the capital costs of establishing ATM networks, to offer services to customers at convenient locations under a unified banner (Engler & Essinger, 2000).

People interact with banks to obtain access to money and payment systems they need. Banks, in fact, offer only what might be termed as a secondary level of utility to customers, meaning that customers use the money access that banks provide as a means of buying the things they really want from retailers who offer them a primary level of utility. Customers, therefore, naturally want to get the interaction with their bank over as quickly as possible and then get on with doing something they really want to do or with buying something they really want to buy. That explains why new types of delivery channels that allow rapid, convenient, accurate delivery of banking services to customers are so popular. Nowadays, customers enjoy the fact that their banking chores are done quickly and easily (Engler & Essinger, 2000).

This does not mean that the brick-and-mortar bank branches will completely disappear. Just as increasing proliferation of mobile phones does not mean that landline telephone kiosks will disappear, so also the popularity of high-tech delivery channels does not mean that physical branches will disappear altogether. It has been found that corporate and older persons prefer to conduct their business through bank branches (Engler & Essinger, 2000).

The kinds of enormous and far-reaching developments discussed above have taken place along with the blurring of demarcations between different types of banking

and financial industry activities. Five reasons can be attributed to it:

1. Governments have implemented philosophies and policies based on an increase in competition in order to maximize efficiency. This has resulted in the creation of large new financial institutions that operate simultaneously in several financial sectors such as retail, wholesale, insurance, and asset management.
2. New technology creates an infrastructure allowing a player to carry out a wide range of banking and financial services, again simultaneously.
3. Banks have to respond to the increased prosperity of their customers and to customers' desire to get the best deal possible. This has encouraged banks to extend their activities into other areas.
4. Banks have to develop products and extend their services to accommodate the fact that their customers are now far more mobile. Therefore demarcations are breaking down.
5. Banks have every motivation to move into new sectors of activity in order to try to deal with the problem that, if they only offer banking services, they are condemned forever to provide only a secondary level of utility to customers (Engler & Essinger, 2000).

Role Of ICT in Banking

Technology is no longer being used simply as a means for automating processes. Instead it is being used as a revolutionary means of delivering services to customers. The adoption of technology has led to the following benefits: greater productivity, profitability, and efficiency; faster service and customer satisfaction; convenience and flexibility; 24x7 operations; and space and cost savings (Sivakumaran, 2005). Harrison Jr., Chairman and Chief Executive Officer of Chase Manhattan, which pioneered many innovative applications of ICT in banking industry, observed that the Internet caused a technology revolution and it could have greater impact on change than the industrial revolution (Engler & Essinger, 2000).

Technology has been used to offer banking services in the following ways (Sivakumaran, 2005):

1. ATMs are the cash dispensing machines that can be seen at banks and other locations where crowd proximity is more. ATMs started as a substitute to a bank to allow its customers to withdraw cash at anytime and to provide services where it would not be viable to open another physical branch. The ATM is the most visited delivery channel in retail banking, with more than 40 billion transactions annually worldwide. In fact, the delivery channel revolution is said to have begun with the ATM. It was indeed a pleasant change for customers to be in charge of their transaction, as no longer would they need to depend on an indifferent bank employee. ATMs have made banks realize that they can divert the huge branch traffic to the ATM. The benefits hence are mutual. Once banks realised the convenience of ATMs, new services started to be added.
2. The phenomenal success of ATMs has made the banking sector develop more innovative delivery channels to build on cost and service efficiencies. As a consequence, banks have introduced tele-banking, call centers, Internet banking,

- and mobile banking. *Tele banking* is a good medium for customers to make routine queries and also an efficient tool for banks to cut down on their manpower resources. The *call center* is another channel that has captured the imagination of banks as well as customers. At these centers, enormous amount of information is at the fingertips of trained customer service representatives. A call center meets a bank's infrastructural, as well as customer service requirements. Not only does a call center cut down on costs, it also results in customer satisfaction. Moreover, it facilitates 24x7 working and offers the "human touch" that customers seek. The call center has large potential dividends by way of improved customer relationship management (CRM) and return on investment (ROI).
- 3 With the Internet boom, banks realized that *Internet banking* would be a good way to reach out to customers. Currently, some banks are attempting to harness the benefits of Internet banking, while others have already made Internet banking an important and popular payment system. Internet banking is on the rise, as is evident from the statistics. Predictions of Internet banking to go the ATM way have not materialized as much as anticipated; many reasons can be cited for this. During 2003, the use of the Internet as a banking channel accounted for 8.5 per cent. But this was due to the false, unrealistic expectations tied to it. Some of the factors that were detrimental in bringing down, or rather, not being supportive, are low Internet penetration, high telecom tariffs, slow Internet speed and inadequate bandwidth availability, lack of extended applications, and lack of a trusted environment.
 - 4 *Mobile banking*, however is being regarded in the industry as "the delivery channel of the future" for various reasons. First and foremost is the convenience and portability afforded. It is just like having a bank in the pocket. Other key reasons include the higher level of security in comparison to the Internet and relatively low costs involved. The possibility that customers will adopt mobile banking is high, considering the exponential growth of mobile phone users worldwide. Mobile banking typically provides services such as the latest information on account balances, previous transactions, bank account debits and credits, and credit card balance and payment status. They also provide their online share trading customers with alerts for pre-market movements and post-market information and stock price movements based on triggers.

Another fallout of the ICT-driven revolution in the banking industry is the Centralized Banking Solution (CBS). A CBS can be defined as a solution that enables banks to offer a multitude of customer-centric services on a 24x7 basis from a single location, supporting retail as well as corporate banking activities, as well as all possible delivery channels -existing and proposed. The centralization, thus, afforded makes a "one-stop" shop for financial services a reality. Using CBS, customers can access their accounts from any branch, anywhere, irrespective of where they have physically opened their accounts. The benefits offered by CBS are:

- 1 Offer a "one-stop" IT management shop.
- 2 Make banks prepared for current as well as future requirements.

- 3 Decrease the risks arising from solutions requiring multiple components and multiple vendors.
- 4 Improve the returns via seamless integration of software and hardware services.
- 5 Provide a greater choice through the availability of an array of technologies (Sivakumaran, 2005).

Information technology has not only helped banks to deliver robust and reliable services to their customers at a lower cost, but has also helped banks make better decisions. Here a data warehouse plays an extremely important role. It essentially involves collecting data from several disparate sources to build a central data warehouse to store and analyze the data. A data warehouse in a bank typically stores both internal data and data pertaining to its competitors. Data mining techniques can then be applied on a data warehouse for knowledge discovery (Hwang, Ku, Yen, & Cheng, 2004). Data warehousing also allows banks to perform time series analysis and online analytical processing (OLAP) to answer various business questions that would put the banks ahead of their competitors.

Apart from the market-driven reasons, compliance-driven reasons are also there behind banks establishing a data warehouse. Basel II accord is one such compliance. Basel II is one of the largest financial shake-ups in recent times; it will eventually lead to new rules and regulations for the banking industry worldwide. Banks were supposed to have their processes and systems in place by the start of 2007, which was when the Basel Committee on Banking Supervision planned to implement the Accord. The crux of Basel II is to ensure that financial institutions manage risk so that they have the adequate capital to cover exposure to debt. Banks will have to carry out a fundamental review and overhaul of their processes and systems in order to achieve compliance. Technology will be at the core of their strategies to meet Basel II requirements. The construction of a historical data store is a key IT initiative that must be pursued on a priority basis within Basel II programmes. This will collect up to three years of operational risk data and up to seven years of credit risk data, and will act as a stepping stone towards a 'single customer view' for managing risk at an individual customer level (Porter, 2003).

The next wave in ICT-driven banking resulted in the creation of the Society for Worldwide Interbank Financial Telecommunication (SWIFT), which is a financial-industry-owned cooperative organization. SWIFT provides secure, standardized messaging services and interface software to 7,650 financial institutions spread over 200 countries. SWIFT's worldwide community includes banks, brokers/dealers, and investment managers, as well as their market infrastructures in payments, securities, treasury, and trade. Establishment of SWIFT is a landmark development in worldwide payment systems in banks and financial institutions. SWIFT, through its comprehensive messaging standards, offers the financial services industry a common platform of advanced technology and access to shared solutions through which each member can communicate with its counter party. SWIFT works in partnership within members to provide low-cost, competitive financial processing and communication services of the highest security and reliability. It contributes significantly to the commercial success of its members through greater automation

of the end-to-end financial transaction process, based on its leading expertise in message processing and financial standards setting. Thus, SWIFT is another important product of the applications of information and communication technologies in the banking industry (Graham, 2003).

CRM through Data Mining

Despite investing enormously into the ICT paraphernalia for providing better services to customers, banks cannot take their customers for granted. Unlike in the olden days, the customers have become more demanding. In other words, if customers are dissatisfied with the services of a particular bank, they immediately shift loyalties to its competitors. Hence, like in other businesses such as retail and insurance, banks have made a paradigmatic shift in their marketing strategies. Consequently, the age-old product-focused strategy has given way to a customer-focused strategy. Hence, building profitable and long-lasting relationships with customers has become paramount to banks. This is precisely where CRM plays a critical role. The main objective of CRM is to make long-lasting and profitable relationships with customers.

The successful adoption of IT-enabled CRM redefines the traditional models of interaction between a business and its customers both nationally and globally. CRM promises achieving corporate objectives, which involves continuous use of refined information about current and potential customers. With IT and communication technologies, banks can offer their customers a variety of products, lower prices, and personalized service. The effective management of information and knowledge is important to CRM for product tailoring and service innovation. It provides a single and consolidated view of the customer, calculating the value of the customer, establishing a strategy for multi-channel-based communication with the customer, and designing personalized transactions. CRM together with data mining helps banks improve their marketing policies to attract more customers and thereby increase their profit. Customer knowledge is recognized as an asset. IT is the enabling technology for discovery and management of customer knowledge (CRM in the UK ref.). With the IT-enabled CRM, relationship marketing has become a reality in recent years to gaining competitive advantage (Rygielski, Wang, & Yen, 2002).

Data mining tools can answer business questions very quickly and accurately now due to the information available, but in the past that was time consuming to pursue. The advent of the Internet has undoubtedly contributed to the shift of marketing focus, as online information is more accessible and abundant. Collecting customer demographic and psychographic data and its analysis makes target marketing possible. Knowledge discovery in databases (KDD) or data mining activities can be categorized into three major groups: discovery, predictive modeling, and forensic analysis. Data mining performs analysis that would be too complicated for traditional statisticians (Rygielski *et al.*, 2002). Most of the banks are investing large amounts of money to collect and store transactional, demographic, and psychographic data of customers. The emphasis is now on how to effectively utilize the customer databases to manage the customer relationship. The potential difficulty of converting data into profits lies in obtaining relevant information from the data

and customize the marketing mix policies to satisfy the consumer's wants and needs (Li, Xu, & Li, 2005).

Banks employ data mining for the following tasks:

1. **Card marketing:** By identifying optimal customer segments, card issuers and acquirers can improve profitability with more effective acquisitions and retention programmes, targeted product development, and customized pricing.
2. **Cardholder pricing and profitability:** Card issuers can take the advantage of data mining to price their products so as to maximize profit and minimize loss of customers. They can also perform risk-based pricing.
3. **Predictive lifecycle management:** Data mining helps banks predict each customer's lifetime value and to service each segment appropriately.
4. **Forensic analysis:** It is unusual to employ data mining for forensic analysis in many domains, but in banking it is a common practice, to look for deviations in the data for fraud detection. Businesses must use technology responsibly in order to achieve a balance between privacy rights and economic benefits. Current CRM solutions are not ensuring customer information privacy fully (Rygielski *et al.*, 2002).
5. **Cross-sell/up-sell:** Using data mining, banks can cross-sell or up-sell their products to customers.
6. **Customer churn modeling:** Customer churn modeling is an important problem for banks and financial institutions to grapple with. Churn happens when existing customers become disgruntled with some aspects of the service of a given bank and shift loyalties to one of its competitors. Data mining techniques are extremely useful in identifying potential churners and giving banks early warning signals. Once potential churners are identified, banks take remedial actions to prevent such customers from leaving. This is because acquiring new customers is time consuming and more expensive than retaining the existing customers.
7. **Anti-money laundering:** Money laundering, considered a major financial crime, is the process of illegally transferring money from one country to another in an innocuous manner so that it goes undetected by law enforcement agencies. With the development of global economy and Internet banking, it is predicted that money laundering crimes will become more prevalent, more difficult to investigate, and more detrimental to the economy and financial systems. The investigation of money laundering crimes involves reading and analyzing thousands of textual documents to generate crime group models (Zhang, Salerno, & Yu, 2003).

Conclusion

This paper describes in a nutshell the evolution of banking and defines banking technology as a consortium of several disciplines, namely finance subsuming risk management, information and communication technology, computer science, and marketing science. It also highlights the quintessential role played by these disciplines in helping banks: (1) run their day-to-day operations in offering efficient, reliable, and secure services to customers; (2) meet their business objectives of

attracting more customers and thereby making huge profits; and (3) protect themselves from several kinds of risks. The role played by smartcards, storage area networks, data warehousing, customer relationship management, cryptography, statistics, and artificial intelligence in modern banking is significantly brought out. To sum up, it is quite clear that banking technology has emerged as a separate discipline in its own right. As regards future directions, the proliferating research in all fields of ICT and computer science can make steady inroads into banking technology because any new research idea in these disciplines can potentially have a great impact on banking technology.

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