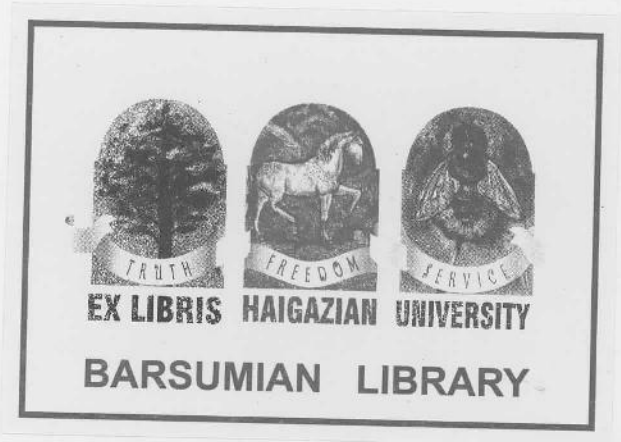

HAIGAZIAN UNIVERSITY

THE EFFECT OF INFORMATION TECHNOLOGY USE ON BANKS' PERFORMANCE IN LEBANON

Empirical study conducted on Lebanese Banks

BY
ROLA NAYEF MODAD

A thesis
Submitted in partial fulfillment of the requirements for the degree of
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AN ABSTRACT OF THE PROJECT

Rola Modad for Master of Business Administration and Economics

Title: The Effect of information technology use on Banks' performance in Lebanon (Empirical study conducted on Lebanese Banks)

In today's open and liberal financial market which promotes competition and the importance of customer service's satisfaction, banks should be able to compete in the markets. New dimensions and new horizons are being explored by the banks in order to satisfy the largest numbers of customers, become more competitive, improve their performance and be able to meet the constant changing needs of the market.

The purpose of this study was to understand Information Technology and its effect on the banks' performance. For this the need of new technology was identified, the achievements through technological innovations were described and the impact on the banks' business activities was studied.

The study involved a group of banks in Lebanon; one of them is the first to apply information technology while the five other banks have been using IT more recently.

The methodology used to obtain the data needed was through two sets of questionnaires, related to the use of IT and to the banks' performance, and distributed to employees and managers. The results were analyzed using various statistical techniques such as hypothesis testing, correlation analysis and regression analysis.

As a result of the conducted analysis, in all the banks, we were able to see how using information technology affected positively the performances of the banks by increasing productivity and business activity.

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1 PURPOSE AND INTRODUCTION

During my work in one of the largest banks in Lebanon I became aware of the importance of Information Technology (IT) on banks' performance. It became obvious that IT is a major issue of our times and has a great impact on the productivity and business activities of banks. This is the reason I decided to study its use and impact on performance.

Banks in Lebanon are mainly playing a traditional role of society's financial go-between. They are playing this role in an open and liberal financial market which promotes competition. Since peace was reestablished in 1991, the concerned official authorities, the association of banks and banks have made considerable efforts to improve fundamentally the competitive structure and means of operations of the Lebanese banking industry. With 70 active commercial banks, the Lebanese Banking sector currently employs about 16,000 individuals in approximately 1000 branches conveniently spread throughout the country, and manages the equivalent of USD 71 billion in assets nation-wide.

Technological innovation in general and information technology applications in particular, have had a major effect in banking and finance. The evolution in technology is expanding continuously. The ability to access information is becoming easier and banks' customers are more and more able to access banks' services on the web. New dimensions and new horizons are being explored by the banks in order to compete in the markets. Thus new services were introduced.

The real business value of information technology has received considerable interest from both academics and the business community in recent years. The key question is whether information technology is having any impact on the business performance of the organizations and whether these investments are having the desired expected payoff. In this

paper I will show how IT development contributed to productivity improvement and business performance.

This research reviews the effects of three major technological innovations on banking organizations. The research also considers innovations in the back office or internal (operational function) changes brought about to banking organizations. Outstanding IT-based innovations are considered and grouped into four distinct periods: early adoption (1864-1945), specific application (1945-1965), emergence (1965-1980) and diffusion (1980-1995). The three technological innovations discussed are the ATM machines, Electronic cards and Online banking. The effect of the previously three stated innovations on the bank's productivity and business performance is analyzed. The main tool used in this study was a questionnaire targeted to managers and employees in different banks.

STATEMENT OF HYPOTHESIS

In this study, we will investigate the real business value of IT in relation with productivity and business performance of the banks.

METHODOLOGY

This study will be divided into two parts. The first will be theoretical. It will include an introduction, review of literature and an overview of three IT dimensions.

The second part will be practical work, where I will use data collected from different banks. The analysis of the results will lead to a conclusion about the impact of IT on productivity and business performance and a few recommendations for management regarding the use of IT.

2 LITERATURE REVIEW

2.1 THE EMERGING NEED FOR NEW TECHNOLOGY

Outstanding IT-based innovations are considered and grouped into four distinct periods: early adoption (1864-1945), specific application (1945-1965), emergence (1965-1980) and diffusion (1980-1995).

EARLY ADOPTION PERIOD

The introduction of telecommunications in banks dates back to 1846 when the telegraph reduced stock price differentials between New York and regional stock markets (Garbade and Silber, 1978). The introduction of the trans-Atlantic cable equally enabled greater integration of securities trading in New York and London. Greater integration took place as the completion of the cable reduced the time delay to execute a trade in New York, which had been initiated in London from six weeks to only one day. According to Garbade and Silber (1978), early innovations such as the trans-Atlantic cable were accompanied by statistically significant evidence that the introduction of primitive forms of telecommunication substantially reduced or even eliminated foreign exchange and security price differentials between geographically distinct markets.

In that period the increasing use of telegraph and telephone facilities also resulted in the availability of information that became homogeneous by linking the head office with the branches in different domestic and international locations and by providing dealers and banks with the same information in a timely manner. However, service remained largely

unaffected by technology with the front office relationship unchanged and controlled locally through systems such as paper-based records and pass-book control.

The main function of the head office was to manage and provide services such as check clearing, relations with the central bank and to manage the bank's liquidity and balance sheet through treasury operations. Head office was also in charge of controlling performance through financial control and inspection methods. Long-term relations of individual customers with the bank retail branch were needed to secure services such as loans or establish credit ratings and as a result, managers of retail bank branches were persons of independent authority and standing in their local communities (Garbade and Silber 1978).

During the late 1930s the first machines were purchased to address the growing volume of transactions and enhance working conditions and productivity of senior staff. This trend was reinforced through the purchase of additional adding and listing machines that supported the growing network of branches and agents. However, the potential of these machines, as well as punch-hole 'accounting' machines, as mechanisms for recording and updating transactions were not fully exploited until after the late 1940s and early 1950s. Performance indicators primarily measured growth in size (such as assets per employee) rather than efficiency or effectiveness "such as financial profitability and credit risk exposure" (Locke 1999).

In brief, early adoptions of telecommunications and computer applications had great impact in banks, especially for those activities that had traditionally been further away from volume transactions through retail bank branches. Banks engaged in this new

technology in a favorable growing market for retail bank services, which expanded as middle income individuals became a growing proportion of the population.

SPECIFIC APPLICATION PERIOD

The second wave of IT innovation in banks begins in the late 1950s and lasted up to the late 1960s. Banks introduced computers to keep up with growth in business volume and to solve very specific problems and automate existing practices of specific departments (Morris, 1986).

At that time, banks started to develop the capacity to handle more complex service tasks with their existing skills and resources. This resulted in the fact that branches became the direct point of contact with customers while, internally, there was a growing need to supply top management with rapid and timely financial information. A process-directed automation system started dominating the specific application period and aimed at undercutting the cost of administrative tasks such as the labor-intensive check clearing system.

During this period, the typical financial sector computer installation consisted of a central mainframe (Fincham 1994), dedicated to sequential batch processing of computer readable instructions dealing with separate processes such as providing a service for handling customer transactions, standing orders and other clerical procedures. Computer applications were therefore concentrated on back-office operations (Morris, 1986), because controlling a growing volume of paperwork provided the potential for economies of scale.

Greater automation and improved communications, such as automatic internal switchboards, resulted in the establishment of central accounting units and in centralization of customer account control so that regional and branch managers lost autonomy to centralized senior managers. Centralization on the back of computer applications, therefore, created a space for standardization of service offering and the potential to reduce cost structures of traditional activities.

The increasing complexity and volume of financial transactions eventually led to the development of Database Management Systems or DBMS (Fincham 1994). The role of the DBMS was to overcome the limitations of conventional filing systems by providing a generalized, structured and integrated body of data that could be read and updated in a controlled, efficient, and reliable way.

In brief, during the specific application period computer-based applications emerged and took place in different departments in banks. During this period the first IT applications in the bank-client transactions were introduced. Enhanced computer power allowed banks to process the growing volume of paper-based transactions in central locations with lower labor costs. This new use of IT applications in banks caused product diversification and new standardized products and services. At the same time, computer power enabled managers of banks to look for more standardized and cheaper labor while a new set of IT-related capabilities began to emerge as a necessary condition for competition in bank markets (Quintás, 1991).

EMERGENCE PERIOD

The third wave of IT innovations in banking emerged with the advances in telecommunications. During the emergence period, banks became one of the world's dominant customers for computer-based applications, far exceeding other sectors such as capital goods manufacturers or transportation (Walker 1978). Between 1968 and 1980 banks emerged as major customers of software and hardware as they became involved in applications which delivered significant cost reductions as well as increased business volume and variety (Walker 1978).

Changes resulting from the emergence of IT were also observed in the recruitment strategies of the banks. Highly skilled university graduates were attracted and prepared for future responsibilities as senior staff at banks and non-bank financial intermediaries. This was a departure from the traditional practice of 'internal job markets' developed in the 1920s, that is, the recruitment and in-house training of low-skilled and risk adverse individuals, who had few ambitions beyond the security of job 'for life' employment offered by banks and would require little motivation. (Parker, 1981).

Other distinctive characteristics of banking organizations during the emergence period included the introduction of full automation to branch accounting, real time operation and control of branches by the central office. That is, IT was able to provide the possibility for each transaction to have direct access to the bank's on-line transaction-processing services (Fincham 1994).

In brief the immediate result of innovations during this period was that customers were able to bank at any point in the retail branch network while before they were limiting

several transactions to the customer's own branch. Also during the emergence period technological change spread to many internal aspects of the banking organization and enhanced bank-client relationships.

These changes started to modify how, when and where customers could enter the banking system but banks had yet to considered multi-delivery channel organizations in their service offering or in their ability to direct all their information to any point of customer contact. It is during this period that the convergence of telecommunications and computer power resulted in true IT applications as the emphasis of technological innovations shifted from data processing to communications.

DIFFUSION PERIOD

The diffusion period of the information revolution in banking saw the spread, of new and powerful applications developed to handle the security required by high-volume payments. IT-related change became critical to support the increase in the speed, quantity and quality of information in the market.

During this period, the IT revolution in banks saw the spread of IT to all aspects of banks' internal organization and market relationships due to the introduction of personal computers (PCs) in clerical and managerial roles. During this period, consumer-oriented innovations were widespread as information technology provided support to all points of contact between customers and banks. PCs offered a flexible way of providing and enhancing computer resources for a wide range of applications. Also, widely available packaged software reduced the need to develop in-house applications. (Source: Morris and Quintas 1991).

The second effect of technical innovations on banks' approach to business during the diffusion period is associated to distribution capabilities. The branch network reduced its importance as the point-of-sale for financial services. This development was facilitated with the advent of digital communications technologies and networks, which allowed the performance and reliability, required for organization-wide integration of data resources as well as more effective extra-organizational networks (Source: Hayes and Hubbard 1990).

In brief, during the diffusion period IT applications resulted in customers acquiring several options when engaging in financial transactions with their main bank but also competing banks. During this period IT developments augmented the range of financial services and product availability by increasing the threat of substitution and by lowering the cost of imitation (Hayes and Hubbard (1990)).

The following table summarizes the dimensions of technological progress in retail banking. These dimensions describe the nature of change caused by technological innovation externally (product or service offerings) and internally (operational function) to the banking organizations. The dimensions provide an historical perspective on the adoption of technological innovation in retail banking.

First of all, we notice that the change induced by innovations in information and communications technologies (IT) reduced price differentials in geographically distant markets. The next stage saw specific IT markets and the impact of IT in specific applications that modified the relations between previously isolated departments in banks. Next, IT applications produced change throughout the whole organizational structure in

terms of internal operations and with respect to bank-client relationships (Source: Morris and Quintas 1991)

In brief, this table outlines key technological innovations in retail finance as grouped into four distinct periods: early adoptions, specific application, emergence and diffusion.

Impact on the Provision of Retail Finance	*Use of Technology in the Organisation*			
	Early Adoption (1846-1945)	Specific Application (1945-1968)	Emergence (1968-1980)	Diffusion (1980-1995)
Innovation in Service Offering	• Reduce inter-market price differentials.	• Conversion from branch to bank relationships. • Automated bank statements. • Cheque guaranty cards.	• Growth of cross border payment. • ATM introduced.	• Supply of non-payment products like insurance, mortgages and pensions.
Operational Function Innovation	• Increased co-ordination between head office and branches.	• Reduce cost of labour intensive activities (i.e. clearing system).	• Automation of branch accounting. • Real time control begins.	• Growth of alternative distribution channels, such as phone banking and EFTPOS.

Sources: Morris (1986) and Quintás (1991)

The retail banking industry had undergone those dramatic changes from a decade ago. Previously, the branch office was the icon of the retail banking institution. Customer access to the bank's financial services and products were generally limited to the hours in which the branch was open, and services and products provided by the bank were relatively limited. The branch, where the majority of the customers did the major of their financial transactions, was the primary representative of the bank (Source: Bryan J. Boutte, AT&T)

In today's markets, things are different. New competitive pressures have emerged from non-banking institutions providing similar services and products, and foreign banks entering domestic markets. Customers have become more intelligent in their buying, less

loyal to a particular bank, and more demanding for a product and services that fit their specific financial needs and time schedules. As a result, consumers dictate where, how and when they will conduct their financial affairs (Source: Bryan J. Boutte, AT&T)

To respond to consumer and market demands, banks must provide greater convenience, increase accessibility of financial services and products, and deliver new, better targeted products and services faster. At the same time, total operations and development costs must be maintained or reduced. All of this must be done to acquire or maintain a significant percentage of the consumer's financial transactions and establish a profit margin (Source: Bryan J. Boutte, AT&T)

2.2 TECHNOLOGICAL ACHIEVEMENTS

In the section below, I will be talking about technological innovations which helped the retail bankers achieve more. These achievements include:

Overcoming geographical and organizational barriers for profitability and growth:

Technological innovations enabled financial institutions to overcome previous constraining barriers to growth and costs savings, such as geographic distances and volume processing obstacles but at the same time also helped in removing many of the previous barriers that prevented competitors from invading the market. Organizational barriers prevented the flow of information causing limitations that were relative to competitor's size and technology. The nature of such constraints has changed as technology changed, and the financial intermediation delivery has changed with it (Source: Bryan J. Boutte, AT&T)

The dimensions of technological innovation in retail banking portray the internal structure of banks as being determined by a combination of changes in banks' external environment and advances in information technology. Pugh (1973) was one of the first contributors to document widespread empirical support on the effect of IT on the organization's structure and its environment relative to competitors' size and technology. According to this view, managers are passive in the adoption of the boundaries drawn around their organization, while the rate of adoption of new technology is subject to the organization's circumstances. However, empirical studies do recognize that despite the limitations imposed by the context in which organizations perform, i.e. geographical constraints, managers have the flexibility to make their influence for pursuing their bank's competitive advantage. In other words, the actions of managers in banking organizations in adopting technology are considered critical to determine how technological innovations modify competition in bank markets.

IT applications promised higher organizational flexibility to banks that could effectively implement technical changes. Lesley Taylor, the head of direct banking in the Royal Bank of Scotland found that technology allowed one person to develop in three or four weeks the skills that previously required five years in the job. According to her, organizational structure is an important factor in determining how technology will affect the innovation process in a bank. The more flexible the bank's structure, the more it could implement IT successfully.

The impact of geographical constraints was also discussed in another study done by Peterson and Rajan (1995) that focused on the USA, in which they found that the banks

closer to the borrowing firms have more market power and can price their loans higher, compared to more distant banks.

Also this impact was thoroughly studied on the European banks and borrowers by to Degryse and Ongena (2005) who found that loan rates decrease with the distance between the borrowing firm and the lending bank and increase with the distance between the borrowing firm and the competing bank.

Both these studies attribute the price discrimination to transportation costs caused by geographical barriers i.e. distance constraints.

Increase monopolistic powers:

Technological innovations develop advantages in the use of propriety information and new tools that have further potential role in the continuation of the transformation process. The benefit of an IT structure is to capture the available resources to meet market demands and achieve business objectives using new resources that are still not accessible to competitors and thus gain the power of dominating the market. The diffusion of technological innovations was mostly spread in larger banks who could afford to invest in such modernization and advancements in order to expand their market and thus increase their monopolistic powers in the market. The technological innovations they acquire give them control over the market and advancement over smaller banks, thus giving them a competitive advantage through new monopolistic powers.

According to Frame and White (2001), they found that larger banking organizations introduce innovations earlier, compared to smaller banks. In many cases, small banks could not afford the large overhead costs of maintaining an advanced technology and had to pay for them in the form of more extensive Correspondent Banking relationship with larger

institutions. This is so, since many of the checks clearing transactions could have been done through the Federal Reserve or private clearing houses, with less deposits requirements than those which the smaller institutions had to maintain in return for the technology assistance through the "Corresponding Banking Relationship".

Other studies also found that technology has the potential to increase monopolistic powers of institutions that develop advantages in the use of propriety information and technology, as suggested by Hausman and Marquez (2002).

Search for a competitive advantage:

The discovery of new opportunities and the identification of the competitor banks vulnerability and where its relative strength provides strategic advantages which can be exploited and magnified. Although such strategies were possible long before computers and new processing and communications technologies were discovered, their implementation and speed of discovery were dramatically accelerated as new technologies were developed and made feasible and accessible.

Brynjolfsson found in a survey done in 1994 that firms that have implemented IT in their organizations have significantly higher productivity than their competitors, which made them gain a crucial competitive advantage in the market.

Also in a study done by Hauswald and Marquez in 2003, they explained how technology results in more and easier access to information and thus helps in gaining a competitive advantage in the market. According to their findings, the bank's capability to process information leads to higher profits as these banks become better in "carving out a niche" in the market and thus generate more information and more competitive advantage.

As a result to all these factors, the decision to design, implement and use an IT structure should be based on its ability to meet consumer needs and the bank's business objectives. Therefore, the IT structure should enable the rapid development of new and existing delivery channels for greater consumer accessibility, reduce development and delivery times for consumer services and products, and reduce total operational and development costs.

Rapid Channel Development:

The types of delivery channels within a retail bank have increased and will continue to do so. New banking symbols such as self-service environments (ATM or Kiosk systems), Automatic voice response, home banking, electronic cards and electronic banking are becoming very important. These innovations include data centers, relationship management environment and call centers that increase the flow within and between each channel in a bank and the environment.

Technological innovations are enabling banks to provide the capabilities necessary to integrate data systems and incorporate channels through information flow. These technologies are allowing banks to develop flexible structures that greatly enhance the development of new delivery channels and their back office environment.

New distribution channels allowed banks to supply more services and this had remarkable effects in the banks' cost structures. The impact of IT in the channel development was studied by Bauer (1995) where he found that by emphasizing IT systems, Citibank (New York) was able to serve 85 per cent of its customers by telephone and electronically. For Citibank, IT development represented lowering the overall cost rate from 70 per cent to 55 per cent with announced reductions of 30 per cent in branch staff

costs (Bauer 1995). This move from more to less expensive distribution channels was possible because the same information or transaction could be delivered through an easier and automated way.

Reduced Delivery Time:

Given the increasing complexity and variety of technology needed to create a consumer product or service, a growing number of component suppliers are required. As a result, the role of systems' integration is becoming crucial and more time consuming.

If a component of the bank's system is not designed for integration, the whole system will require additional time, resources and money to fix the integration problems. However through the use of standards, the open systems-based components can be easily integrated, therefore reducing time and costs, which in return will reduce overall consumer product or service development and delivery times.

Total Cost Reduction:

When the distribution channels were relatively limited and the number of consumer products and services were few, it seemed appropriate to use separate structures for each distribution channel. As a result, each channel had its own networking infrastructure, data and transaction systems, application systems and end-users systems. Also each channel had its independent support services and administration personnel. This structure caused a high cost of designing, operating and maintaining multiple applications, and a system that used to provide similar and limited consumer products and services.

Alpar and Kim (1991) studied the effect of IT over total cost reduction in 759 banks. They found that a 10% increase in IT capital is associated with 1.9% decrease in total cost. Also several studies on information technology's impact on cost reduction were

done, including one by Weitzendorf and Wigand (1991) in which they developed a model of information used in two firms, and another study by Pulley and Braunstein (1984), which both found a positive association between IT and cost reduction.

Today, with the growing number of channels, the total costs of ownership must be marginal. Open systems and new internet based environment enable the consolidation of networks, data, operations, maintenance and personnel. As a result, the cost to develop, maintain and manage a channel can be reduced.

As a result, the emerging need for new technologies enables retail bankers to meet their business objectives: greater product or service accessibility, customer convenience, better targeted products and services by overcoming barriers, the gain of a competitive advantage in the market and the increase of their profit margins.

2.3 THE GROWTH OF NON-TRADITIONAL BANK'S SERVICES

Today, the relationship between banks and technology seems to be reversed; banks are now led by technology. Banks used to influence the development of technology; now technology influences the way banks conduct business. The reason resides in the development of alternative channels to fit the customers' needs through technology.

The Internet has increased customers' expectations, creating a need for "anytime and anywhere banking" (The Banker, November 2001). Financial institutions are constantly racing to improve their electronic banking system. Nevertheless all the new services have dramatically changed the banking field and reduced the need for bank agencies. Therefore, the future of banking seems to be linked to applications developed to run throughout a personal computer, mobile phones and internet. These devices were not created to cater to the needs of banking institutions but are increasingly used for such purpose (The Banker).

The payment systems, such as credit or debit cards, have considerably influenced banks. A study conduced by the Federal Reserve in 2000 revealed an explosion in electronic payments. Check payments have fallen from 85% in 1979 to 60% in 2000. Since the last study dates from 1979, it is hard to really evaluate the proportional change. However, Fed Vice Chairman Roger Ferguson said, "We believe the results clearly paint a picture of a payments system in migration" from paper to electronic methods of payment (Federal Reserve).

ATMs, electronic cards and online Banking (internet or e-banking) are some examples of how banking institutions have contributed to technological improvements. These original technologic tools were dedicated to better develop the relationship between

a bank and its customers and to offer a range of services at anytime, even when the branches were closed.

2.3.1 AUTOMATIC TELLER MACHINES

An automatic teller machine or ATM allows a bank customer to conduct its banking transactions from almost every other ATM machine in the world. Wetzel, Barnes and Chastain developed the first real ATM cards, cards with a magnetic strip and a personal ID number to get cash. ATM cards had to be different from credit cards (then without magnetic strips) so account information could be included.

The first ATMs were off-line machines, meaning money was not automatically withdrawn from an account. The bank accounts were not (at that time) connected by a computer network to the ATM. Therefore, banks were at first very exclusive about who they gave ATM privileges to, giving them only to credit card holders with good banking records. They also used to accept only a single-use token or voucher, which was retained by the machine. These worked on various principles including radiation and low-coercively magnetism that was wiped by the card reader to make fraud more difficult(Visa International).

2.3.1.1 HOW ATM'S WORK

Today ATMs are activated by inserting a cash or credit card that contains the user's account number and PIN on a magnetic stripe. The ATM calls up the bank's computers to verify the balance, dispenses the cash and then transmits a completed transaction notice.

The word "machine" in the term "ATM machine" is certainly redundant, but widely used (Visa International).

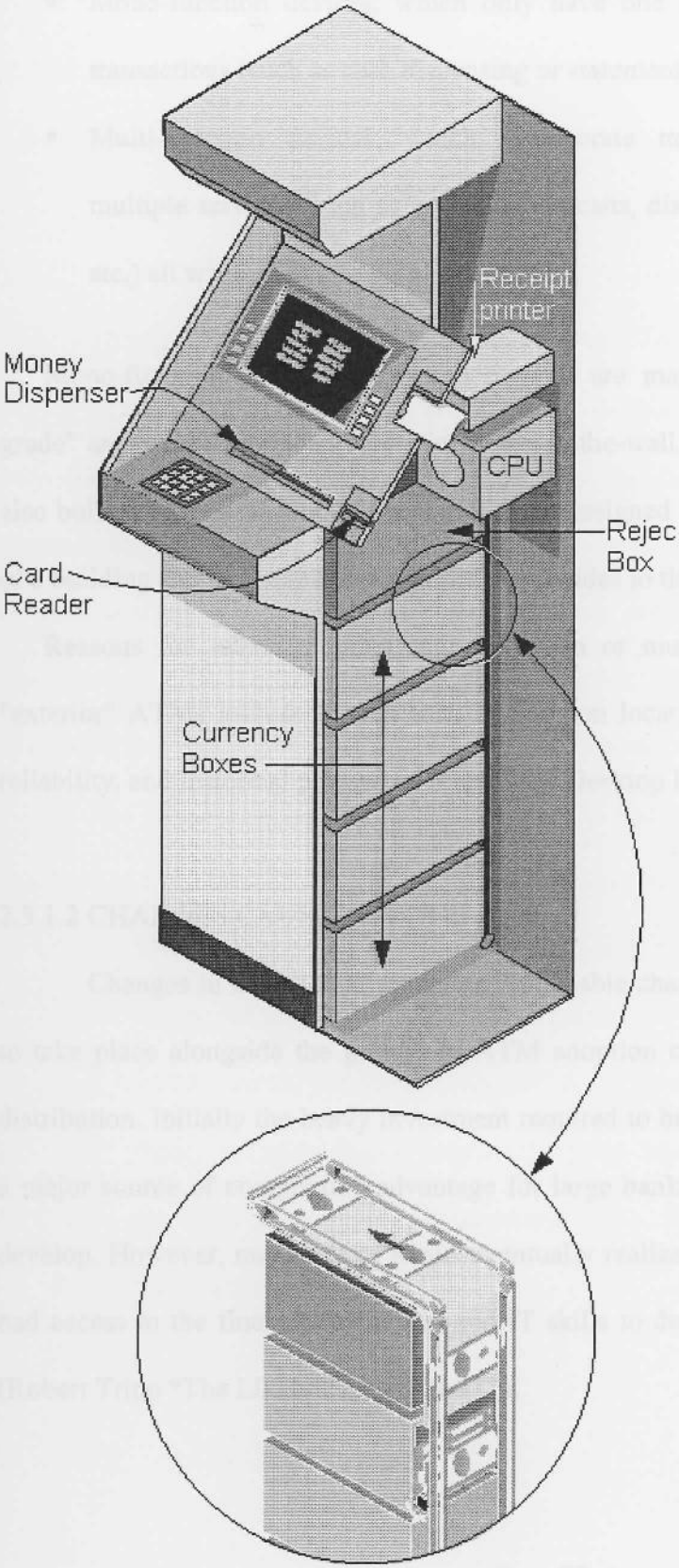
ATMs first came into wide use during the early- to mid-1980s. Notable historical models of ATMs include the IBM 3624 and 473x series, Diebold TABS 9000 and 10xx series, and NCR 5xxx series. (Visa International)

The number of Cash Dispensers has increased constantly so people do not have to go to their banking branch to withdraw cash or make deposits. Computer terminals are activated by a magnetically encoded Bank Card that allow costumers to make deposits, obtain cash from checking or savings accounts, pay bills, transfer money between accounts, and do other routine transactions as they would at a bank teller window. Today bank ATMs do much more than dispense cash in preset increments. Some ATM machines cash checks to the penny, accept envelope-free deposits, and print monthly statements for mortgage, brokerage, or regular banking accounts. Some U.S. Banks have programmed their machines to offer ATM customers access to all of the banking services available on the bank's Internet Web site, effectively duplicating the bank's Web site on the ATM display screen (Computer Desktop Encyclopedia).

On most modern ATMs, the customer identifies him or herself by inserting a plastic card with a magnetic stripe or a plastic smartcard with a chip that contains his or her card number and some security information, such as an expiration date or CVC (CVV). Customers then verifie their identity by entering a code often referred to as a **PIN** (**P**ersonal **I**dentification **N**umber) of four or more digits. Upon successful entry of the PIN, the customer may perform a transaction. After the transaction is complete, a transaction record

is printed, usually consisting of the action taken, date and time, location, any applicable fees, and available balance. (Computer Desktop Encyclopedia)

If the number is entered incorrectly several times in a row (usually three attempts per card insertion), some ATMs will attempt retain the card as a security precaution to prevent an unauthorized user from discovering the PIN by guesswork. Captured cards are often destroyed if the ATM owner is not the card issuing bank, as non-customer's identities cannot be reliably confirmed (Visa International). In some cases, a transaction may be performed at the ATM that allows the customer's PIN to be changed securely.



There are two main types of ATMs that have developed over time:

- Mono-function devices, which only have one type of mechanism for financial transactions (such as cash dispensing or statement printing).
- Multi-function devices, which incorporate multiple mechanisms to perform multiple services (such as accepting deposits, dispensing cash, printing statements, etc.) all within a single footprint.

Mono-function and multi-function devices are manufactured both regular "interior grade" and weather-resistant "exterior, through-the-wall grade" variants. Some ATMs are also built as fully self-contained exterior units designed to sit alone without the protection of a building and be completely exposed on all sides to the elements.

Reasons for selecting either mono-function or multi-function and "interior" versus "exterior" ATMs include device cost, installation location, customer wait times, desired reliability, and historical preference (Computer Desktop Encyclopedia).

2.3.1.2 CHANGES CAUSED BY THE ATM

Changes in the internal structure: Noticeable changes in bank organizations started to take place alongside the growth in ATM adoption complementing retail bank branch distribution. Initially the heavy investment required to build an ATM network was seen as a major source of competitive advantage for large banks, so interconnection was slow to develop. However, managers of banks eventually realized that few financial organizations had access to the financial resources and IT skills to develop widespread ATM networks (Robert Tripp "The Likely Changes to IT").

Changes in the cost structure: ATM opened the way for banks to improve their cost structures provided that customers change their behavior according to banks' expectations. Providing accounts costs less through an ATM than through the teller. (Robert Tripp, "The Likely Changes to IT").

2.3.1.3 ATMs IN LEBANON

The first ATM was installed in Lebanon in 1994. Since then, the number of ATMs has grown, as competition has increased in offering new services to customers at convenient times and locations. ATM services can be provided either in the national currency or in US dollars. The ATMs permit customers who have an access card (a credit or debit or cash card) and a PIN to withdraw cash either from their accounts or against a line of credit. They are either located inside the premises of a bank or another company or in outside their walls (universities, hospitals, big stores…).

The installation of ATMs by banks and bank-owned companies requires prior notification to Central Bank and is subject to the following conditions:

- The number of ATMs installed outside a bank's doors should not exceed the number of the bank's branches in addition to its head office.
- ATMs should accept all types of cards authorized and listed by the Central Bank, whether issued domestically or internationally and their respective networks should have connections with all other networks used for card transactions in Lebanon

- Companies owning ATMs' networks should inform the Central Bank of the name of the owners and the number of the participants on the network. The companies must also respect the Banking Secrecy Law.
- Clearing and settlement should be performed domestically - i.e. without passing through international networks.
- The use of all cards issued should be subject to the agreed arbitration procedure to settle any disputes (Central Bank).

Any other company wishing to install an ATM requires prior approval by the Central Bank and must enter into a contract with the sponsoring bank to define their respective responsibilities. The number of ATMs installed by the company will be deducted from the sponsoring bank's permissible number of ATMs located outside its premises and these ATMs should accept all domestic and international cards listed by Central Bank (Central Bank).

ATMs now operate only on-line. They are directly connected to the operating networks in Lebanon (and connected between themselves as well) and to the communication system of the bank. The network operator and accounting department verify the PIN and other details centrally. On-line operation reduces credit card fraud. Until the end of 2002, some ATMs operated off-line, but this has been phased out following Basic Decision No. 7299 of 10 June 1999 (Central Bank).

Also, local banks have begun to respond to the rising demand with an increase in the number of ATMs. They are dispersed geographically as follows:

- Beirut and its suburbs: 56%
- Mount Lebanon: 20%

- North Lebanon: 9.5%
- South Lebanon and Nabatieh: 8.5%
- Bekaa: 6%

The increase number of ATM per year is also summarized in the following table, according to a study done by the Central Bank.

Table 1

Year	No. of ATMs	Points of sale
1997	183	N/A
1998	290	N/A
1999	377	N/A
2000	442	N/A
2001	580	23,853
2002	686	26,622
2003 ('till end of June)	731	23,853

The usage of ATMs in Lebanon was studied by the Central bank in a recent survey done on the Lebanese market. They found that a small percentage (8.6%) of card holders has never used an ATM machine and only uses it at points of sale. Out of those who use their cards at ATM machines, the highest proportion (30%) use it once a week, followed by 23.3% who only use a machine once a month. Another 13.8% use an ATM twice a week, and 61.6% believe it reduces their visits to the bank by more than 70%. Penetration of once-a-week users was highest in the older age groups, declining progressively in lower age groups. The majority of those who use ATMs (99.4%) go to withdraw cash, while 35.8% go to check their account balance and 13.8% go to review their previous

transactions. Almost 60% of those who use ATM machines feel that it would be more efficient to pay bills through an ATM. While age was not a significant factor, those most receptive to the idea were in the 25–34 age bracket, followed by those in the 35–44 bracket (Central Bank).

2.3.2 ELECTRONIC CARDS

Electronic cards, as we know them today, have been around for just over half of a century. One of the first electronic cards appeared in 1951 when loan customers of Franklin National Bank of New York were screened for credit and those approved were given a card they could use to make retail purchases. Participating merchants copied the customer information from the card onto a sales slip and the bank would credit the merchant account for the loan less a flat fee to cover the costs of providing the loan. In 1958, The American Express Company (a company built on the traveler's check business) began issuing a charge card for travel and entertainment charges which was accepted at participating restaurant, hotel and airline merchants (American Express).

Cardholders enjoyed the convenience of plastic charge cards (especially when on the road for business) as well as the line of credit offered by the new bank credit cards. Merchants found that credit card customers usually spent more than if they had to pay with cash (which is still true today – the average credit card purchase is 112% more than if cash is used). Accepting bank-issued cards was safer for the merchant than dealing with cash (more secure from internal and external theft and error) and less expensive than creating and maintaining a merchant-specific credit program (American Express).

Credit cards would enhance the convenience of retailers and individuals. Conveniences increased because cards offered more stable value than checks (which are easier to forge or

risk failure because of insufficient funds) and are more portable than cash (i.e., higher value to bulk ratio). Cards did not and have not displaced bank issued money for two reasons. First, because card-based transactions involve the payment of commissions to both the merchant acquirer and the card issuer. This payment typically involves a percentage of the transaction's value and thus, introduced the need for a minimum transaction value so card payments would be cost effective for card issuers.

Second, card receipts are redeemable only by the merchant acquirer or the card issuer rather than payable on demand (Visa International).

Credit card technology seems likelier to succeed by concentrating on:

- Unattended locations (such as telephone booths, transportation stations, vending machines, etc) where operational savings are high and customer benefits evident.
- Customer segments that do not have a plastic card but desire one.
- Places with multiple functions (such as university campus cards or social security payments).

Types of Electronic Cards:

- Debit cards, pay now (pay from a checking / savings account)
- Credit cards, pay later (pay monthly payments with interest)
- Prepaid cards, pay before (pay from a cash account that has no check writing privileges)

As credit card processing became more complicated, outside service companies began to sell processing services to VISA and MasterCard association members. This reduced the

cost of programs for banks to issue cards, pay merchants and settle accounts with cardholders, thus allowing greater expansion of the payments industry.

Visa and MasterCard developed rules and standardized procedures for handling the bankcard paper flow in order to reduce fraud and misuse of cards. The two associations also created international processing systems to handle the exchange of money and information and established an arbitration procedure to settle disputes between members (Visa, MasterCard).

2.3.2.1 ELECTRONIC CARDS IN LEBANON

There are two main types of payment cards used in Lebanon, international and local cards, both of which can be issued by banks and non-banks. In practice, the issuers are mainly banks and credit card companies. Large retailers and other businesses also issue payment cards but with restricted purposes. The particular range of services provided depends on the contract between the issuer and the cardholder, but the majority of cards used in Lebanon provide three services - cash access, debit and credit card payment services (Central Bank).

Most card issuers charge administrative costs and annual fees. Annual fees vary according to the services provided (international or national payments, immediate or deferred debit, or cash withdrawals only).

The number and use of payment cards is rapidly expanding in Lebanon but is still small compared with check payments. Card issuers and merchant are very selective in admitting new cardholders and in signing up merchants respectively. In addition, the use of cards needs a well-designed network and settlement system that operates within specified laws

and regulations. In this context, Basic Decision No. 7548 issued by the Central Bank constitutes the first step in this direction in order to develop a network system (Central Bank). It obliges banks, financial institutions and other relevant supervised institutions to notify central bank before using electronic means to perform any previously approved activities (Central Bank).

The types of cards in Lebanon are as follows:

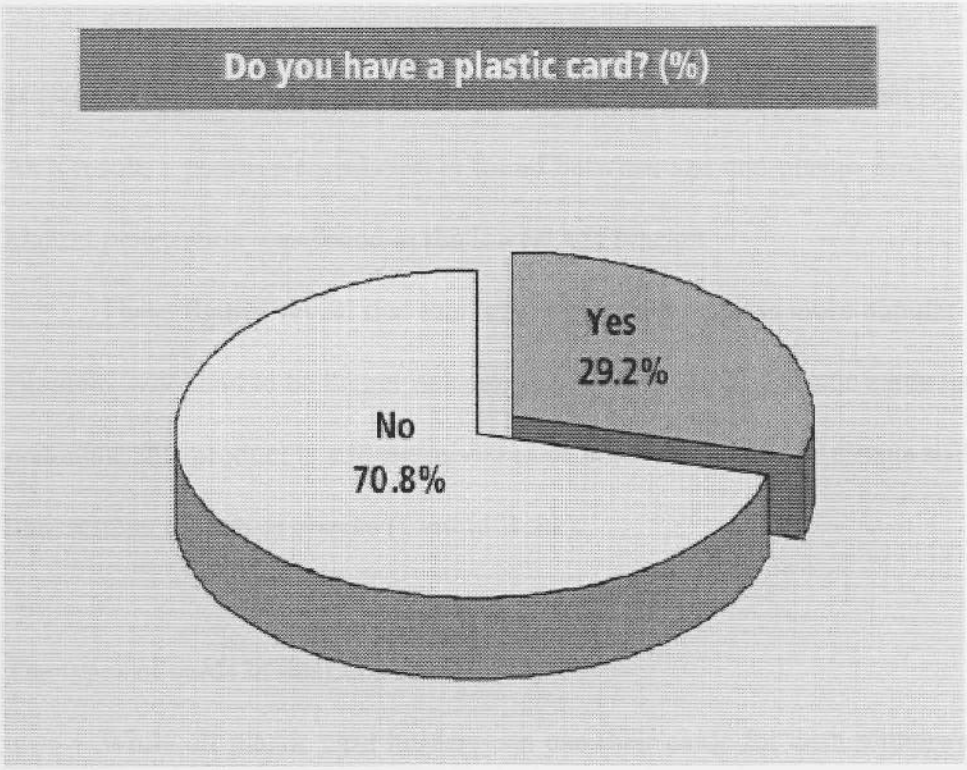
- **Credit Cards.** They are used as a mean of payment and as a form of credit. A different range of services is offered by different card-issuing institutions. The cardholder holds an account with the card-issuing bank or with any other bank from which the settlement is done (direct debit).
- **Debit Cards.** They enable cardholders to make payments, which are debited to their bank accounts. Unlike a credit card customer, the holder of a debit card must necessarily hold an account at the issuing bank.
- **Charge cards.** Holders of these types of cards must settle the total of their bill at the end of each month.

The retail market for credit and debit cards in Lebanon has seen substantial modernization and a considerable shift from the use of cash to plastic money. Accordingly, the Central Bank has specified the following types of cards for use in the country: Visa, MasterCard, American Express, Diner's Club, Cashless Card, Banker net / Visa Electron and Maestro Cirrus.

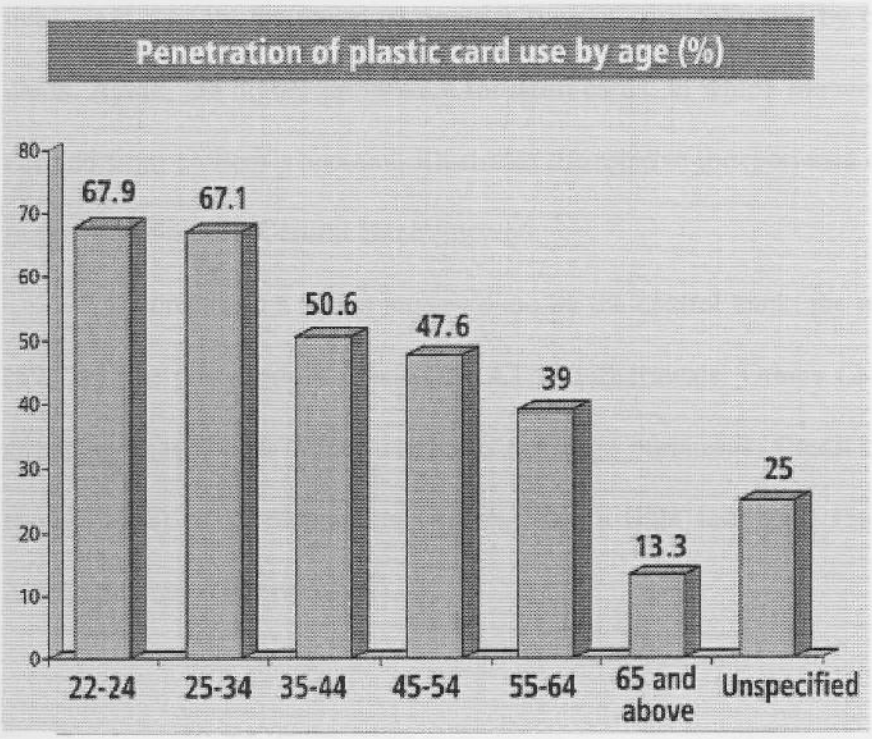
In a survey done in 2005 by the Central Bank and with the cooperation of the major banks operating in the Lebanese market, they found that only 29.2 percent of the

population holds a plastic card while 70.8 percent do not. This low percentage of plastic cards users is due to many cultural, financial and social mentalities where people still prefer to make all their payments in cash. The majority of the Lebanese still believe in the importance of carrying physical money notes and in the fact that cards are not a reliable mean of payment or for receiving their payments.

Financial factors are a large component in the use of cards. Still, according to the same survey, people with an income ranging from $501–$1,000 made up the largest proportion of plastic card holders, followed by the $200–$500 bracket and $1,001–$1,500 bracket. They made up 43.2%, 19.1% and 16.7% of card holders respectively. Typically, there was a positive relationship, in terms of penetration, between income and plastic cards holders, with penetration at its highest in the upper income brackets, falling to 67.5% in the $1,001-$1,500 bracket and 61.4% in the $501-$1,000 bracket.



(Source: Central Bank)



(Source: Central Bank)

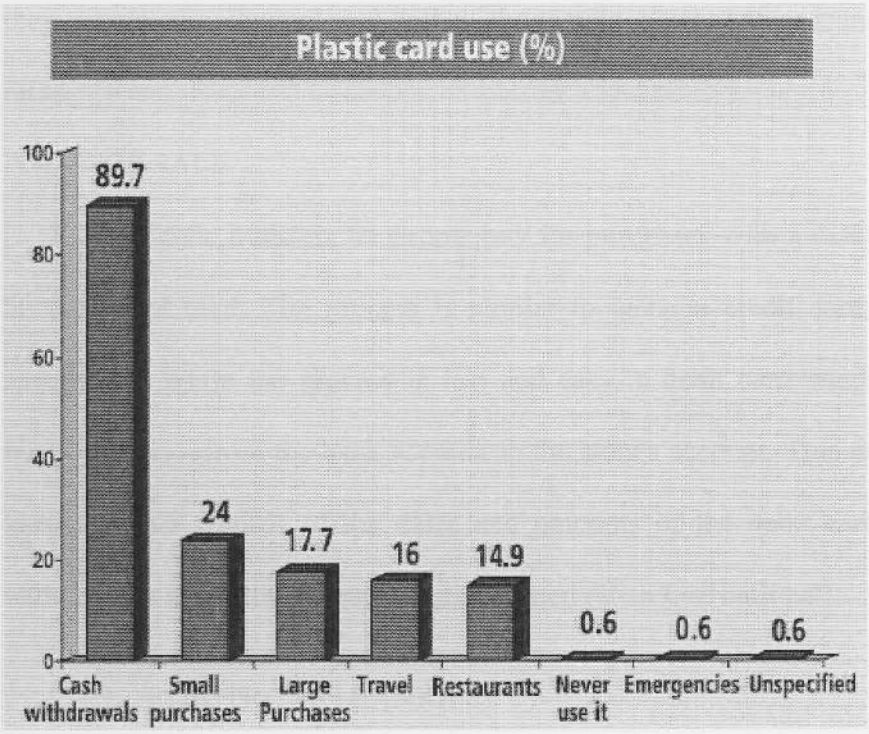
According to the same survey, in terms of age, it was worth noticing that the largest proportion of plastic card holders fell into the 25-34 year age group that represented 32.6%. As a result, a positive correlation is found between age and plastic card holders where the highest penetration was found in the lowest age bracket.

These figures reveal that this retail banking product is more popular among younger clientele, who tend to be bigger risk-takers. While the use of plastic cards has become more prevalent, this product is still perceived to be somewhat risky, as clients still prefer to make transactions in cash or checks (Central Bank).

The types of cards in the Lebanese Market

While all plastic card holders can use their cards for cash withdrawals from ATM machines, not all have cards that can also be used at points of sale, like retail shops. The debit card was by far the most popular type of card followed by charge cards and credit cards. Again, the higher preference for debit cards, in which the whole amount is instantly debited from a client's account, illustrates the relative inexperience of the Lebanese market in the use of credit (Central Bank Survey).

According to a recent survey done by the central bank, the majority of card holders (89.7%) use this product mostly for ATM withdrawals. Others (24%) use cards to make small purchases and 17.7% use them for large purchases. Credit cards are also used for travel (16%) or at restaurants (14.9%) and a little less than 1% reserves the card for emergency use (Central Bank).



Factors in choosing a card

In the same survey done by the Central Bank, respondents were asked to rank the importance of factors when choosing a plastic card, from a scale of 1 to 5, with 1 being the least important and 5 being the most important. The results showed that the service charge on ATM withdrawals was the number one factor considered ranked at 4.41. This was followed by the ease in acquiring the card at 4.35 and the length of the process at 4.34. The applicable interest rate came next at 4.28, while the requirements for obtaining a card were ranked at 4.20. Annual card fees were also a factor, but ranked at a lower 4.19 and the least important factor was considered the allowable card limit, at 4.16 (Central Bank).

However, it was noticed that cardholders were generally unaware of either the fees or interest rates that the banks charge. Half of those with cards didn't know the interest rate

they were being charged and half of those who claimed they knew suggested unrealistic rates.

POINT OF SALE

Point-of-Sale transfers let people pay for purchases with a debit card, which also may be the ATM card. The process is similar to using a credit card, with some important exceptions. While the process is fast and easy, a debit card purchase transfers money - fairly quickly - from the bank account to the store's account. This means a person needs to keep accurate records of the dates and amounts of the debit card purchases and ATM withdrawals in addition to any checks written (Visa International).

2.3.3 ELECTRONIC BANKING

Electronic banking is the wave of the future. It provides enormous benefits to consumers in terms of the ease and cost of transactions. But it also poses new challenges for country authorities in regulating and supervising the financial system and in designing and implementing macroeconomic policy (Banking Operations Strategies Technologies).

E-banking is a term used for performing transactions, payments etc. over the Internet through a bank, credit union or secure websites. This allows customers to do their banking outside of bank hours and from anywhere where Internet access is available. In most cases a web browser such as Internet Explorer is utilized and any normal Internet connection is suitable. No special software or hardware is usually needed. ("Electronic Finance. A New Approach to Financial Sector Development" 2002).

Electronic banking has been around for some time in the form of automatic teller machines and telephone transactions. More recently, it has been transformed by the Internet, as a new delivery channel for banking services that benefits both customers and banks. Access is fast, convenient, and available around the clock, whatever the customer's location. Also, banks can provide services more efficiently and at substantially lower costs. For example, a typical customer transaction costing about $1 in a traditional bank branch or $0.60 through a phone call costs only about $0.02 online (Robert Tripp "The Likely Changes to IT").

Electronic banking also makes it easier for customers to compare banks' services and products, can increase competition among banks, and allows banks to penetrate new markets and thus expand their geographical reach. Some even see electronic banking as an opportunity for countries with underdeveloped financial systems to overcome developmental stages. Customers in such countries can access services more easily from banks abroad and through wireless communication systems, which are developing more rapidly than traditional wired communication networks (Bankers on line Technologies).

The other side of this technological boom is that electronic banking is subject to some risks, particularly governance, legal, operational, and reputation, inherent in traditional banking. In addition, it poses new challenges. In response, many regulators have already modified their regulations to achieve their main objectives: ensuring the safety and soundness of their banking system, promoting market discipline, and protecting customer rights and the public trust in the banking system (Bankers on line Technologies).

2.3.3.1 TRENDS IN ELECTRONIC BANKING

Internet banking is gaining ground. Banks increasingly operate websites through which customers are able not only to inquire about account balances and interest and exchange rates but also to conduct a range of transactions. Unfortunately, data on Internet banking are scarce, and differences in definitions make cross-country comparisons difficult. The Scandinavian countries have the largest number of Internet users; with up to one-third of Internet banking is still concentrated in the largest banks ("Electronic Finance, A New Approach to Financial Sector Development" 2002).

To this date, most banks have combined the new electronic delivery channels with traditional branches, but a small number have emerged that offers their products through electronic distribution channels. These "virtual" or Internet-only banks do not have a network of branches but might have a physical presence, for example, an administrative office; they also have no branch facilities like kiosks or automatic teller machines. The United States has about 30 virtual banks; Asia has 2, launched in 2000 and 2001; and the European Union has several—either as separately licensed entities or as subsidiaries or as branches ("Electronic Finance, A New Approach to Financial Sector Development" 2002).

2.3.3.2 NEW CHALLENGES FOR REGULATORS

This changing financial landscape brings with it new challenges for bank management and regulatory and supervisory authorities. The major ones come from increased cross-border transactions due to lower transaction costs and the ease of banking activities, and from the reliance on technology to provide banking services with the necessary security.

- **Regulatory Risk**. Because the Internet allows services to be provided from anywhere in the world, there is a danger that banks will try to avoid regulation and supervision. They can require even banks that provide their services from a remote location through the Internet to be licensed. Licensing would be particularly appropriate where supervision is weak and cooperation between a virtual bank and the home supervisor is not adequate.
- **Legal Risk**. Electronic banking carries sharp legal risks for banks. Banks can potentially expand the geographical scope of their services faster through electronic banking than through traditional banks. Money laundering is an age-old criminal activity that has been greatly facilitated by electronic banking because of the anonymity it affords. Once a customer opens an account, it is impossible for banks to identify whether the nominal account holder is conducting a transaction or even where the transaction is taking place. To combat money laundering, many countries have issued specific guidelines on identifying customers. They typically comprise recommendations for verifying an individual's identity and address before a customer account is opened and for monitoring online transactions, which requires great vigilance. ("Electronic Finance. A New Approach to Financial Sector Development?" 2002, World Bank Discussion Paper), (Stijn Claessens, Thomas Glaessner, and Daniela Klingebiel, 2002, "Electronic Finance: Reshaping the Financial Landscape around the World").

In a report issued in 2000, the Organization for Economic Cooperation and Development's Financial Action Task Force raised another concern. With electronic banking crossing national boundaries, whose regulatory authorities will investigate

and pursue money laundering violations? The answer, according to the task force, lies in coordinating legislation and regulation internationally to avoid the creation of safe havens for criminal activities.

- **Operational Risk**. The reliance on new technology to provide services makes security and system availability the central operational risk of electronic banking. Security threats can come from inside or outside the system, so banking regulators and supervisors must ensure that banks have appropriate practices in place to guarantee the confidentiality of data, as well as the integrity of the system and the data. Banks' security practices should be regularly tested and reviewed by outside experts to analyze network vulnerabilities. Also banks should be able to manage the increasing transaction volumes and new technological developments that have an increasing impact on their budgets. Furthermore they should have the ability to attract staff with the necessary expertise, and potential dependence on external service providers. Managers should take into consideration that the operational risks need to become an integral part of banks' overall risk management policy. (According to the Organization for Economic Cooperation and Development's Financial Action Task Force)
- **Reputation Risk**. Violation of security can damage a bank's reputation. The more a bank relies on electronic delivery channels, the greater the potential for reputation risks. If one electronic bank encounters problems that cause customers to lose confidence in electronic delivery channels as a whole, this can potentially affect other providers of electronic banking services. In many countries where electronic banking is becoming the trend, bank supervisors have put in place internal guidance

notes for examiners. Reputation risk may result in a loss of confidence in electronic delivery channels. Consumer education where regulators and supervisors can assist may help consumers in using and understanding this concept. Some banks issue tips on Internet banking, offer consumer help lines, and issue warnings about specific entities that may be conducting unauthorized banking operations in the country. (According to the Organization for Economic Cooperation and Development's Financial Action Task Force)

2.3.3.3 REGULATORY TOOLS

There are four key tools that regulators need to focus on to address the new challenges posed by the arrival of e-banking.

- **Adaptation**: In light of how rapidly technology is changing and what the changes mean for banking activities, keeping regulations up to date is a time-consuming and complex task. In May 2001, the Bank for International Settlements issued its "Risk Management Principles for Electronic Banking," which discusses how to extend, adapt, and tailor the existing risk-management framework to the electronic banking setting. It recommends that a bank's board of directors and senior management review and approve the security control process, which should include measures to authenticate the identity and authorization of customers, protect data integrity, and ensure segregation of duties within e-banking systems, databases, and applications. Regulators and supervisors must also ensure that their staffs have the relevant technological expertise to assess potential changes in risks, which may require

significant investment in training and in hardware and software. (According to The Bank for International Settlements).

- **Legalization:** New methods for conducting transactions, new instruments, and new service providers will require legal definition, recognition, and permission. For example, it will be essential to define an electronic signature and give it the same legal status as the handwritten signature. Existing legal definitions and permissions—such as the legal definition of a bank and the concept of a national border—will also need to be rethought. (Benjamin M. Friedman, 2000, "Decoupling at the Margin: The Threat to Monetary Policy from the Electronic Revolution in Banking,")
- **Harmonization:** International harmonization of electronic banking regulation must be a top priority. This means intensifying cross-border cooperation between supervisors and coordinating laws and regulatory practices internationally and domestically across different regulatory agencies.. (Source: Benjamin M. Friedman, 2000, "Decoupling at the Margin: The Threat to Monetary Policy from the Electronic Revolution in Banking,")
- **Integration**: This is the process of including information technology issues and their accompanying operational risks in bank supervisors' safety and soundness evaluations. In addition to the issues of privacy and security, for example, bank examiners will want to know how well the bank's management has elaborated its business plan for electronic banking. A special challenge for regulators will be supervising the functions that are outsourced to third-party vendors. (Source:

Benjamin M. Friedman, 2000, "Decoupling at the Margin: The Threat to Monetary Policy from the Electronic Revolution in Banking,")

While electronic banking can provide a number of benefits for customers and new business opportunities for banks, it increases traditional banking risks. Even though considerable work has been done in some countries in adapting banking and supervision regulations, continuous revisions will be essential as the scope of e-banking increases. In particular, there is still a need to establish greater harmonization and coordination at the international level. Moreover, the ease with which capital can potentially be moved between banks and across borders in an electronic environment creates a greater sensitivity to economic policy management (Bank for International Settlements, Basel Committee on Banking Supervision, 2000, "Electronic Banking Group Initiatives").

2.3.3.4 ONLINE BANKING IN LEBANON

Online banking usually offers such features as:

- Bank statements, with the possibility to import data in a personal finance program such as Quicken or Microsoft Money.
- Electronic bill payment.
- Funds transfer between a customer's own checking and savings accounts.
- Loan applications and transactions, such as repayments.
- Account aggregation to allow the customers to monitor all of their accounts in one place whether they are with their main bank or with other institutions.

Online banking methods

The bank provides its customers with proprietary software to install on their computers. The software allows the person to get connected to the bank's computers over a secure network. The personal computer becomes in a way a virtual teller, ready to assist the bank's clients in their banking needs.

Advantages

- Bank's customers can bank from any location that has an internet connection.
- Customers can have better control over their money; they have access to their accounts 24 hours a day. They can see which checks have cleared and which amount was withdrawn or deposited.
- Real time monitoring of the account.
- Transfer of funds from one account to another.

Drawbacks

- An internet connection is needed all the time to access internet-based accounts.
- The ability to access the account depends on technology and on the reliability of web servers and other computers. ("E-Lebanon: Banking, Payments, and ICT" conference, Beirut)

Regulations by the Central Bank

The central bank has determined certain conditions for this service in the Lebanese banks. These following conditions must be met:

1. The client should be at least eighteen years old, with full contractual capacity.
2. No information could be given about the client's account without his prior and unequivocal, written permission.
3. Digital signatures are accepted only when they meet the following conditions:
    - There should be a clear agreement between the concerned parties.
    - The signatory should use a personal identification code.
    - The institution implementing the transaction should confirm it within 24 hours by electronic mail, and within one week by surface mail, unless the client requests his/her mail to be kept with the said institution.
    - The implementing institution should provide the client with a detailed monthly statement of account, to be sent to an address of his/her choice.

The ceiling on aggregate credits extended through electronic means by a single institution to one real or moral person shall not exceed 20% of its own funds. In this respect, banks continue to be governed by BDL regulations concerning the ceilings on their credit facilities.

3 STATISTICAL ANALYSIS

In this chapter we will perform a statistical analysis to answer the question "Is IT use increasing the bank's performance". We will write about the survey that was conducted in the banking industry regarding the use of IT and its impact on the banks performance.

3.1 METHODOLOGY

The methodology used to obtain the data and information needed was through questionnaires. We used two sets of questionnaires, one related to the use of IT and the other set related to the bank's performance.

We worked with the first bank (Bank A), which is considered one of the biggest banks in Lebanon and we will use it as a benchmark.
We also contacted 10 other Lebanese banks and 5 of them were willing to cooperate (Other Banks). We sent 10 questionnaires for each bank to be distributed by the Human Resources to randomly selected senior employees.

We made clear that these questionnaires were anonymous, so the banks' employees were required to answer as honestly and frankly as possible.
The questionnaires contain 24 questions related to the use of IT and 19 questions related to the bank's performance. We also included at the end of the questionnaire four open ended questions that helped us recognize the perception of the employees regarding the effect of technology on their bank. (Appendix A)

The answers to choose from were "1" being strongly disagreeing with the statement, "2" disagreeing, "3" being neutral, "4" agreeing and "5" strongly agreeing with the statement.

With a minimum of 2 years experience required, the questionnaires were sent to 67 employees from Bank A and 100 employees from Other Banks. However, only 30 employees from Bank A returned the questionnaires and 40 employees from the Other Banks returned them.

The following statistical analysis techniques will be applied to analyze the results obtained from the questionnaires:

First, we will perform reliability tests to test our data.

Then, we will conduct hypothesis testing regarding the proportions of favorable answers for all questions.

Finally, correlation and regression analysis will be performed to determine the interdependencies among the variables and determine the significant factors.

3.2 RELIABILITY TESTS

Before starting analyzing our data, we performed the Cronbach's Alpha test in order to test the reliability of our data. The following tables summarize the results obtained regarding Bank A, Other Banks and the combined data.

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Case Processing Summary

		N	%
Cases	Valid	40	100.0
	Excluded[a]	0	.0
	Total	40	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.812	43

Reliability Statistics

Cronbach's Alpha	N of Items
.775	43

Case Processing Summary

		N	%
Cases	Valid	70	100.0
	Excluded [a]	0	.0
	Total	70	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.731	43

After performing the above reliability tests, the results obtained from the tables show that all our data is reliable and consistent.

3.3 TESTING PROPORTIONS

In this step, we tested the following hypotheses in order to answer the question "Is Bank A using IT effectively?" We conducted two tests regarding the proportions of favorable answers (agree and strongly agree).

Test 1: The proportion of employees in Bank A answering "Agree" or "Strongly Agree" is higher than 67% that is the null and alternative hypotheses are:

H_0: $p = 0.67$

H_1: $p = 0.67$

Test 2: The proportion of employees in Bank A answering "Agree" or "Strongly Agree" is higher than 50% that is the null and alternative hypotheses are:

H_0: $p = 0.5$

H_1: $p = 0.5$

The two tests were conducted for the 24 questions related to IT use. Running the hypothesis test gave us the following result.

Hypothesis test for proportion vs. hypothesized value:

Observed	*Hypothesized*	
0.8	0.67	p (as decimal)
24/30	20/30	p (as fraction)
24.	20.1	X
30	30	n
	0.0858	std. error
	1.51	z
	.0650	p-value (one-tailed, upper)

The observed value is the proportion of employees that answered "strongly agree" and "agree" to the question "The bank's employees reacted positively to technological innovations". The hypothesized value is 0.67 (We considered that this value refers to more than two third of the employees). N is the number of employees in Bank A which is 30. The P-value= 0.0650. From these results we can conclude that the test is significant. Therefore, there is strong evidence that the great majority of the employees in Bank A do think that they have a positive reaction to technological innovations in their bank.

A summary of the P values obtained are given in the following table:

Questions	Proportion	Test 1	Test 2
Branch managers contribute positively to technological innovations	60.00%	.7926	.1367
The bank's employees reacted positively to technological innovations	80.00%	0.064976	.0005
The organizational level most affected by the changes caused by technological innovations is Teller	80.00%	0.064976	.0005
The organizational level most affected by the changes caused by technological innovations is Customer Service	93.33%	0.00108	1.03E-06
The organizational level most affected by the changes caused by technological innovations is manager assistant manager	66.67%	0.515486	.0339
The organizational level most affected by the changes caused by technological innovations is top management	53.33%	0.944302	.3576
The level most hostile to these changes is teller	26.67%	0.999999	.9947
The level most hostile to these changes is CSO	20.00%	1	.9995
The level most hostile to these changes is manager/Assistant Manager	13.33%	1	1.0000
The level most hostile to these changes is top management	13.33%	1	1.0000
The bank's customers are adopting new innovations introduced by the bank	93.33%	0.00108	1.03E-06
Customers are afraid of using dematerialized money	13.33%	1	1.0000
Are ATMs being used outside the bank's official opening hours	100.00%	1.00E+00	1.0000
People are using the bank's ATMs to withdraw money in places other than the bank's branches	100.00%	1	1.0000
Electronic cards are used as payment cards	100.00%	1.00E+00	1.0000

The amount of checks decreased due to payments done by using cards	46.67%	0.99107	.6424
There has been enough confidence in electronic cards	80.00%	.0650	.0005
You noticed a positive relationship between income and cards usage	86.67%	.0110	2.95E-05
According to your observation, the most important factor in choosing a card is Services obtained	86.67%	.0110	2.95E-05
According to your observation, the most important factor in choosing a card is ease in acquiring	86.67%	.0110	2.95E-05
According to your observation, the most important factor in choosing a card is length of the process	66.67%	.5153	.0339
According to your observation, the most important factor in choosing a card is interest rate and annual fees	86.67%	.0110	2.95E-05
Customers mainly use online banking for Transfer	64.29%	.6239	.0587
Customers mainly use online banking for statement checking	100.00%	1	1.0000

From the results, we observe that test 1 was significant for 13 questions out of 24 questions.

In particular the test was highly significant for questions regarding:

- Employees positive reactions to IT
- Effect of IT on Teller
- Effect of IT on Customer Service
- Customer's adoption of IT
- IT use outside the branch
- IT use after opening hours
- Use of payment cards
- Enough confidence in payment cards

- Positive relationship of cards with income
- Importance of the service obtained from the card
- Ease in acquiring the card
- Interest rate and annual fees of the card
- Ease in using online banking for statement checking

As for test 2, we found additional significant results regarding:

- Effect of IT on Managers and Assistant Managers
- Length of the process in choosing a card
- Use of online banking for money transfer

Overall, we had 13 questions with most answers favorable to those questions and 3 additional questions with a majority answering favorably to those questions. Thus we have indication that Bank A is effectively using IT. However, attention should be given to issues regarding:

- Fear of using dematerialized money
- Decrease in checks numbers

Similar tests were conducted to the performance of Bank A. The results obtained are given in the table below:

Questions	Proportion	Test 1	Test 2
The cost of labor activity decreased after the introduction of technological innovations	33.33%	1.0000	.9661
Technology enabled your bank to overcome Geographical Barriers	100.00%	1.0000	1.0000
Technology enabled your bank to overcome Growth barriers	86.67%	.0110	2.95E-05
Technology enabled your bank to overcome Cost saving	80.00%	.0650	.0005
The bank is gaining competitive advantage due to its advance in technology in terms of Increased market share	80.00%	.0650	.0005
The bank is gaining competitive advantage due to its advance in technology in terms of Increased Profit	93.33%	.0011	1.03E-06
The bank is gaining competitive advantage due to its advance in technology in terms of increased capital	66.67%	.5153	.0339
Information exchange between employees / units has improved due to technological advance	100.00%	1.0000	1.0000
A decrease has occurred in the time that each transaction takes due to faster information exchange	93.33%	.0011	1.03E-06
Technological innovations are decreasing the amount of man power needed to operate the branch	40.00%	.9992	.8633
Technological innovations are increasing business performance	100.00%	1.0000	1.0000
Technological innovations are contributing to an overall increase in productivity	100.00%	1.0000	1.0000
Due to ATM usage, a decrease in the congestion inside the branch was noticed	66.67%	.5153	.0339
More business activity is taking place because of the use of cards	86.67%	.0110	2.95E-05
Online banking was capable of reaching enough customers to make this innovation profitable to the bank	66.67%	.5153	.0339

Online banking has increased the bank's security measures	93.33%	.0011	1.03E-06
These technological advances have required a higher level of technological expertise	100.00%	1.0000	1.0000
These technological innovations are helping in the harmonization within the bank's different departments	86.67%	.0110	2.95E-05
Using online banking has decreased work done inside the branch	33.33%	1.0000	.9661

From the results, we observed that test 1 was significant for 13 questions out of 19 questions.

In particular the test was highly significant for the questions regarding:

- Overcoming geographical barriers
- Overcoming growth barriers
- Cost saving
- Competitive advantage and increase in market share
- Increase in profit
- Easier information exchange
- Decrease in transaction time
- Increase in business performance
- Increase in productivity
- Increase in business activity
- Change in the bank's security measures
- Change in the levels of employees expertise
- Harmonization within the departments

As for test 2, we found additional significant results regarding:

- Increase in capital
- Decease in branches congestion
- Profitable innovation

Overall, we have 13 questions with answers favoring those questions and 3 additional questions with a majority answering favorably to those questions. Thus we have indication that Bank A is performing better with IT. However, attention needs to be given to issues regarding:

- Labor cost
- Change in the amount of man power
- Internal work in the branches

In the following section we performed the tests to answer the question "Are other Banks using IT effectively?" Two tests regarding the proportion of favorable answers (agree and strongly agree) were conducted. The tests are:

Test 1: The proportion of employees in the Other Banks answering "Agree" or "Strongly Agree" is higher than 67%, that is the null and alternative hypotheses are:

H_0: $p = 0.67$

H_1: $p = 0.67$

Test 2: The proportion of employees in the Other Banks answering "Agree" or "Strongly Agree" is higher than 50%, that is the null and alternative hypotheses are :

H_0: $p = 0.5$

H_1: $p = 0.5$

The two tests were conducted for the 24 questions related to banks performances using IT. A summary of the P values obtained are given in the following table.

Questions	Proportion	Test 1	Test 2
Branch managers contribute positively to technological innovations	77.50%	.0789	.0003
The bank's employees reacted positively to technological innovations	87.50%	.0029	1.05E-06
The organizational level most affected by the changes caused by technological innovations is Teller	82.50%	0.018543	1.97E-05
The organizational level most affected by the changes caused by technological innovations is Customer Service	82.50%	0.018543	1.97E-05

The organizational level most affected by the changes caused by technological innovations is manager assistant manager	82.50%	.0185	1.97E-05
The organizational level most affected by the changes caused by technological innovations is top management	70.00%	0.343286	1.0000
The level most hostile to these changes is teller	30.00%	1	0.994294
The level most hostile to these changes is CSO	17.50%	1	0.99998
The level most hostile to these changes is manager/Assistant Manager	15.00%	1	0.999995
The level most hostile to these changes is top management	10.00%	1	1
The bank's customers are adopting new innovations introduced by the bank	80.00%	0.040184	7.39E-05
Customers are afraid of using dematerialized money	7.50%	1	1
Are ATMs being used outside the bank's official opening hours	95.00%	8.29E-05	6.27E-09
People are using the bank's ATMs to withdraw money in places other than the bank's branches	75.00%	0.140956	7.83E-04
Electronic cards are used as payment cards	90.00%	9.89E-04	2.10E-07
The amount of checks decreased due to payments done by using cards	72.50%	0.229719	0.002213
There has been enough confidence in electronic cards	72.50%	0.229719	2.21E-03
You noticed a positive relationship between income and cards usage	87.50%	0.002914	1.05E-06
According to your observation, the most important factor in choosing a card is Services obtained	87.50%	0.002914	1.05E-06
According to your observation, the most important factor in choosing a card is ease in acquiring	72.50%	0.229719	2.21E-03
According to your observation, the most important factor in choosing a card is length of the process	65.00%	0.606038	0.02889
According to your observation, the most important factor in choosing a card is interest rate and annual fees	100.00%	1.00E+00	1.00E+00
Customers mainly use online banking for Transfer	39.29%	.9999	.9122
Customers mainly use online banking for statement checking	100.00%	1	0.999767

From the results, we observed that test 1 was significant for 12 questions out of 24 questions.

In particular the test was highly significant for the questions regarding:

- Positive mangers contributions to IT
- Positive employee's reaction to IT
- Effect of IT on Tellers
- Effect of IT on Customer services
- Effect of IT on Managers and Assistant Managers
- Customer's adoption of IT
- Use of IT after the banks' opening hours
- Use of payment cards
- Positive relationship of cards with income
- Importance of service obtained from the card
- Interest rate and annual fees of the card
- Ease of using online banking in statement checking

As for test 2, we found additional significant results regarding:

- Effect of IT on top management
- Use of IT outside the branches
- Decrease in checks numbers
- Enough confidence in payment cards
- Ease in acquiring the cards
- Length of the process in choosing a card

Overall, we had 12 questions with most answers favorable to those questions and 6 additional questions with a majority answering favorably to those questions. Thus we have indication that the Other Banks are effectively using IT. However, attention should be given to issues regarding:

- Fear of using dematerialized money
- Transfer issues using online banking

Similar tests were conducted to performance of Other Banks. The results obtained are given in the table below.

Questions	Proportion	Test 1	Test 2
The cost of labor activity decreased after the introduction of technological innovations	45.00%	0.998457	0.736455
Technology enabled your bank to overcome Geographical Barriers	89.47%	0.002067	1.09E-06
Technology enabled your bank to overcome Growth barriers	95.00%	8.29E-05	6.27E-09
Technology enabled your bank to overcome Cost saving	77.50%	0.078932	2.52E-04
The bank is gaining competitive advantage due to its advance in technology in terms of Increased market share	92.50%	0.000302	3.81E-08
The bank is gaining competitive advantage due to its advance in technology in terms of Increased Profit	92.50%	0.000302	3.81E-08
The bank is gaining competitive advantage due to its advance in technology in terms of increased capital	60.00%	0.826783	0.102952
Information exchange between employees / units has improved due to technological advance	95.00%	8.29E-05	6.27E-09

A decrease has occurred in the time that each transaction takes due to faster information exchange	95.00%	8.29E-05	6.27E-09
Technological innovations are decreasing the amount of man power needed to operate the branch	67.50%	0.473191	0.013428
Technological innovations are increasing business performance	95.00%	8.29E-05	6.27E-09
Technological innovations are contributing to an overall increase in productivity	85.00%	0.007737	4.77E-06
Due to ATM usage, a decrease in the congestion inside the branch was noticed	85.00%	7.74E-03	4.77E-06
More business activity is taking place because of the use of cards	67.50%	0.473191	1.34E-02
Online banking was capable of reaching enough customers to make this innovation profitable to the bank	42.86%	9.80E-01	7.16E-01
Online banking has increased the bank's security measures	64.29%	0.591303	0.126549
These technological advances have required a higher level of technological expertise	92.86%	0.013917	3.03E-04
These technological innovations are helping in the harmonization within the bank's different departments	78.57%	0.16247	1.11E-02
Using online banking has decreased work done inside the branch	21.43%	0.999947	9.89E-01

From the results, we observed that test 1 was significant for 11 questions out of 19 questions.

In particular the test was highly significant for questions regarding:

- Overcoming geographical barriers
- Overcoming growth barriers
- Cost saving
- Competitive advantage and market share increase

- Increase in profit
- Easier information exchange
- Decrease in transaction time
- Increase in business performance
- Increase in productivity
- Decrease in braches congestion
- Change in the levels of employees expertise

As for test 2, we found additional significant results regarding:

- Increase in capital
- Change in the amount of man power
- Increase business activity
- Harmonization within the bank

Overall, we have 11 questions with answers favoring those questions and 4 additional questions with a majority answering favorably to those questions. Thus we have indication that Other Banks are performing better with IT. However, attention needs to be given to issues regarding:

- Labor cost
- Make IT profitable
- Banks security measures
- Internal work

The third step in testing proportions is test 3 that will be performed to answer the question "Is Bank A using IT more effectively than the Other Banks?" We will compare Bank A to Other Banks regarding the use of information technology. The test is:

Test 3: The proportion of the employees in Bank A answering "Agree" or "Strongly Agree" is higher than that of Other Banks.

H_0: $p_1 = p_2$

H_1: $p_1 = p_2$

Hypothesis test for two independent proportions

p1	*p2*	*pc*	
0.9333	**0.825**	**0.8714**	**p (as decimal)**
28/30	**33/40**	**61/70**	**p (as fraction)**
27.999	**33.**	**60.999**	**X**
30	**40**	**70**	**n**
	0.1083	**difference**	
	0.	**hypothesized difference**	
	0.0808	**std. error**	
	1.34	**Z**	
	.0902	**p-value (one-tailed, upper)**	

P1 is the proportion of the sum of the frequencies answered "agree" or "strongly agree" to the following statement: "the organizational level most affected by IT is Customer Services" related to Bank A.

P2 is the proportion of the sum of the frequencies answered "agree" or "strongly agree" to the same above statement related to Other Banks.

The P- value is 0.09 for above statement. The value obtained shows us that the test is not highly significant so we can conclude that there's only some evidence that the proportion of employees in Bank A answering "Agree or Strongly Agree" is higher than that of the Other Banks regarding that specific statement.

The following table summarizes the results obtained from test 3 for Bank A and the Other Banks regarding the use of information technology.

Questions	Proportion A	Proportion B	Test 3
Branch managers contribute positively to technological innovations	60.00%	77.50%	0.9431
The bank's employees reacted positively to technological innovations	80.00%	87.50%	0.8032
The organizational level most affected by the changes caused by technological innovations is Teller	80.00%	82.50%	0.6049
The organizational level most affected by the changes caused by technological innovations is Customer Service	93.33%	82.50%	0.0902
The organizational level most affected by the changes caused by technological innovations is manager assistant manager	66.67%	82.50%	0.9368
The organizational level most affected by the changes caused by technological innovations is top management	53.33%	70.00%	0.9234

The level most hostile to these changes is teller	26.67%	30.00%	0.6199
The level most hostile to these changes is CSO	20.00%	17.50%	0.3951
The level most hostile to these changes is manager/Assistant Manager	13.33%	15.00%	0.5783
The level most hostile to these changes is top management	13.33%	10.00%	0.3324
The bank's customers are adopting new innovations introduced by the bank	93.33%	80.00%	0.0574
Customers are afraid of using dematerialized money	13.33%	7.50%	0.2105
Are ATMs being used outside the bank's official opening hours	100.00%	95.00%	1.0000
People are using the bank's ATMs to withdraw money in places other than the bank's branches	100.00%	75.00%	1.0000
Electronic cards are used as payment cards	100.00%	90.00%	1.0000
The amount of checks decreased due to payments done by using cards	46.67%	72.50%	0.9860
There has been enough confidence in electronic cards	80.00%	72.50%	0.2345
You noticed a positive relationship between income and cards usage	86.67%	87.50%	0.5409
According to your observation, the most important factor in choosing a card is Services obtained	86.67%	87.50%	0.5409
According to your observation, the most important factor in choosing a card is ease in acquiring	86.67%	72.50%	0.0764
According to your observation, the most important factor in choosing a card is length of the process	66.67%	65.00%	.4421
According to your observation, the most important factor in choosing a card is interest rate and annual fees	86.67%	100.00%	
Customers mainly use online banking for Transfer	64.29%	39.29%	.0192
Customers mainly use online banking for statement checking	100.00%	100.00%	.4180

From the results, we observed that test 3 is significant for the following 7 questions: In particular the test was highly significant for questions regarding:

- Effect of IT on Customer Service officers

- Customers adoption of new technology
- Use of IT outside the bank's hours
- Use of IT in places other than the branches
- Use of payment cards
- Ease in acquiring the service
- Ease of using online banking for money transfer

Given these results, we can conclude that although Bank A is claiming that it is using IT better, this does not show in the perception of its employees.

After performing Test 3 on the use of Information Technology for Bank A and Other Banks, we will now perform the same test regarding the performance of Bank A and Other Banks. The test will answer the following question "is Bank A performing better than the Other Banks?" The test is:

Test 3: The proportion of the employees in Bank A answering "Agree" or "Strongly Agree" is higher than that of Other Banks.

H_0: $p_1 = p_2$

H_1: $p_1 = p_2$

The following table summarizes the results obtained from test 3 for Bank A and the Other Banks regarding the performance of banks using Information Technology.

Questions	Proportion A	Proportion B	Test 3
The cost of labor activity decreased after the introduction of technological innovations	33.33%	45.00%	.8380
Technology enabled your bank to overcome Geographical Barriers	100.00%	89.47%	1.0000
Technology enabled your bank to overcome Growth barriers	86.67%	95.00%	.1644
Technology enabled your bank to overcome Cost saving	80.00%	77.50%	.4004
The bank is gaining competitive advantage due to its advance in technology in terms of Increased market share	80.00%	92.50%	.9390
The bank is gaining competitive advantage due to its advance in technology in terms of Increased Profit	93.33%	92.50%	.4469
The bank is gaining competitive advantage due to its advance in technology in terms of increased capital	66.67%	60.00%	.2838
Information exchange between employees / units has improved due to technological advance	100.00%	95.00%	1.0000
A decrease has occurred in the time that each transaction takes due to faster information exchange	93.33%	95.00%	.6171
Technological innovations are decreasing the amount of man power needed to operate the branch	40.00%	67.50%	.9891
Technological innovations are increasing business performance	100.00%	95.00%	1.0000
Technological innovations are contributing to an overall increase in productivity	100.00%	85.00%	1.0000
Due to ATM usage, a decrease in the congestion inside the branch was noticed	66.67%	85.00%	.9647
More business activity is taking place because of the use of cards	86.67%	67.50%	.0321
Online banking was capable of reaching enough customers to make this innovation profitable to the bank	66.67%	42.86%	.0241
Online banking has increased the bank's security measures	93.33%	64.29%	.0022
These technological advances have required a higher level of technological expertise	100.00%	92.86%	1.0000

These technological innovations are helping in the harmonization within the bank's different departments	86.67%	78.57%	.1911
Using online banking has decreased work done inside the branch	33.33%	21.43%	.1322

According to these results, we have evidence that Bank A is performing better in the following areas:

- Overcoming Geographical barriers
- Faster information exchange between employees/ units
- Increase in business performance
- Increase in productivity
- Increase in business activity
- Profitability of using IT to the bank
- Increased security measures
- Change in technical expertise

As for the remaining areas, we have evidence that the performance is the same for Bank A and the Other banks, except for the question regarding IT is decreasing the amount of man power needed. An explanation for this is that Bank A could have been using IT for a long time and the decrease in man power could have had happened few years ago.

3.4 CORRELATION MATRIX

Our next step is to determine the representative variables that are not correlated among each other. We constructed the correlation matrix for the questions related to the use and performance for Bank A, Other Banks and the combined data.

We used the correlation matrix in order to select a set of variables that are not correlated with each other.

We also had to remove three cases and the last two questions form our analysis since the answers in these cases and questions contain N/A values.

The computer output is shown in the following tables:

Correlation Matrix for the Use of Information Technology in Bank A:

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	
Q1	1.000																				
Q2	.094	1.000																			
Q3	.301	.307	1.000																		
Q4	.239	.246	.804	1.000																	
Q5	.473	.024	-.028	.241	1.000																
Q6	.046	.238	-.125	.179	.643	1.000															
Q7	-.703	-.066	-.402	-.375	-.133	.375	1.000														
Q8	-.642	-.003	-.298	-.347	-.329	.134	.897	1.000													
Q9	-.322	.377	-.051	-.188	-.413	-.034	.407	.498	1.000												
Q10	-.186	.422	-.077	-.246	-.258	-.063	.281	.224	.809	1.000											
Q11	.135	-.050	-.200	-.188	.350	.200	.109	.057	-.484	-.317	1.000										
Q12	-.425	-.223	-.301	-.475	-.347	-.186	.362	.163	.369	.539	-.155	1.000									
Q13	.022	.322	.290	.180	.158	.032	.215	.287	.024	.119	.161	-.212	1.000								
Q14	.365	-.340	.199	.199	.308	.022	-.204	-.164	.602	.532	.203	-.332	.480	1.000							
Q15	-.346	.171	.275	.259	-.366	-.118	.299	.395	.319	.218	-.491	.122	.443	.025	1.000						
Q16	-.241	-.575	.000	-.207	-.399	-.356	.097	-.059	-.094	.094	-.255	.513	-.072	.132	.140	1.000					
Q17	.599	-.139	-.159	-.066	.249	.014	-.663	-.746	-.257	-.170	-.109	-.067	.523	.028	-.648	.000	1.000				
Q18	.229	.451	.116	-.110	-.235	-.368	-.433	-.251	.082	.084	-.013	-.086	.242	.134	-.191	-.180	.301	1.000			
Q19	.320	.183	-.037	.082	.396	.286	-.462	-.569	-.339	-.207	.031	-.221	-.070	.153	-.556	-.055	.678	.499	1.000		
Q20	.279	-.202	.304	.027	-.044	-.364	-.324	-.242	-.422	-.408	.045	-.111	.404	.683	-.062	.319	.144	.561	.370	1.000	
Q21	.273	.205	.216	-.028	-.137	-.375	-.427	-.385	-.277	-.207	.220	-.127	.180	.305	-.385	-.018	.335	.885	.556	.738	1.000
Q22	-.151	.706	.286	.068	-.289	-.244	-.134	-.082	.208	.420	-.169	.075	.380	-.174	.319	-.094	-.257	.528	.073	.106	.386

The correlation matrix shows the correlation between the following variables:

- There is a high correlation between Q1 and Q7. This means that the stronger an employee feels that the branch manager is contributing positively to IT changes, this employee will be less likely to answer positively that the level most hostile to IT changes is the teller.
- There is a high correlation between Q1 and Q8. This shows that the stronger an employee feels about the positive contribution of the branch manager to IT, he will less likely answer positively to the customer service officer's (CSO) hostility to these changes.
- There is a high correlation between Q1 and Q17. This means that if the bank manager is contributing positively to IT changes, then the customers' confidence in electronic cards is high.
- There is a high correlation between Q2 and Q16. This means that the stronger an employee feels that he reacted positively to technological innovations, he will be less likely to answer positively that the use of cards has decreased the amount of checks.
- There is a high correlation between Q3 and Q4. This means that the stronger an employee feels that the organizational level most affected by technological innovations is the teller, he will most likely answer positively to the question regarding also the effect of IT on CSO.
- There is a high correlation between Q5 and Q6. This means that the stronger an employee feels about the fact that the branch manger or assistant manager is

affected by IT, he will most likely answer positively to the effect of IT on top management.

- There is a high correlation between Q17 and Q19, Q20, Q21, Q22. This means that an employee answering positively to confidence in electronic cards will also answer positively to the importance of the ease in acquiring it, the length of the process and the annual fees.

Correlation Matrix for the Use of Information Technology in Other Banks:

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q2
Q1	1.000																					
Q2	.079	1.000																				
Q3	.184	-.161	1.000																			
Q4	.256	-.012	.969	1.000																		
Q5	-.185	-.185	-.061	-.092	1.000																	
Q6	-.264	.573	-.168	-.085	.553	1.000																
Q7	.017	-.341	-.090	-.177	-.174	-.387	1.000															
Q8	-.254	-.254	-.099	-.218	-.051	-.047	.797	1.000														
Q9	-.140	-.054	-.816	-.812	-.126	-.082	.465	.389	1.000													
Q10	-.082	-.082	-.806	-.803	-.084	-.197	.385	.266	.936	1.000												
Q11	.385	-.128	-.336	-.248	-.224	-.280	.272	.046	.572	.512	1.000											
Q12	.128	-.556	-.080	-.050	.112	-.373	.194	-.292	.095	.239	.238	1.000										
Q13	-.250	-.381	-.169	-.234	-.121	-.378	.432	.239	.167	.329	-.220	.440	1.000									
Q14	.068	-.267	.603	.543	.025	-.173	.254	.350	-.365	-.341	.000	-.233	.038	1.000								
Q15	.340	-.569	.546	.561	-.029	-.478	.355	.012	-.306	-.332	.304	.371	-.060	.513	1.000							
Q16	.309	-.152	-.075	-.101	.116	-.033	.260	.035	-.011	-.036	-.192	.214	.277	-.267	-.024	1.000						
Q17	.486	.018	.629	.708	-.161	-.206	-.132	-.311	-.624	-.565	.000	.043	-.208	.497	.704	-.157	1.000					
Q18	-.152	.455	-.057	-.039	.000	.331	-.413	.054	-.113	-.242	-.169	-.732	-.838	.000	-.359	-.076	-.154	1.000				
Q19	-.106	.698	-.059	-.077	-.129	.400	-.452	-.011	-.091	-.186	-.348	-.812	-.472	-.199	-.651	-.106	-.241	.647	1.000			
Q20	.278	.492	.626	.623	-.183	.205	-.320	-.027	-.674	-.691	-.437	-.556	-.378	.291	-.080	-.079	.402	.329	.587	1.000		
Q21	.328	.393	.558	.546	-.014	.275	-.134	.124	-.405	-.481	-.257	-.501	-.389	.372	-.083	-.035	.285	.130	.448	.863	1.000	
Q22	.566	-.057	.495	.575	-.043	-.191	-.045	-.318	-.433	-.337	.000	.347	.141	.212	.434	.254	.504	-.205	-.379	.213	.183	1.00

The correlation matrix shows the correlation between the following variables:

- There is a high correlation between Q2 and Q19. This means that the employee answering positively to the positive reaction of the bank's employees regarding IT changes, will most likely answer positively to the importance of the service obtained in choosing a card.
- There is a high correlation between Q3 and Q9. This means that the employee answering positively to the effect of IT on the teller will be less likely to answer positively to the question regarding the hostility of the managers and assistant managers to IT.
- There is a high correlation between Q12 and Q18, 19, 20, 21. This means that the employees answering negatively about the customers' fear of using dematerialized money are likely to answer positively to the positive relationship between income and card usage, the importance of the ease in acquiring a card and the length of the process.
- There is a high correlation between Q15 and Q17. This means that there's a correlation between the use of the cards as payment cards and the confidence in electronic cards. An employee answering positively to the use of electronic cards as payment cards is most likely answering positively to the question regarding confidence in electronic cards.
- There is a high correlation between Q20 and Q21. This means that an employee answering positively to the importance of ease in acquiring a card will most

likely answer positively to the importance of the length of the process in choosing a card.

Correlation Matrix for the Use of Information Technology regarding Bank A and Other Banks.

	1	2	3	4	5	5	7	8	9	0	1	2	3	4	5	Q16	Q17	Q18	Q19	Q20	Q21	Q22
1	1.000																					
2	.069	0																				
3	.213	9	0																			
4	.158	0	7	0																		
5	.228	0	8	8	0																	
5	-.052	5	2	9	5	0																
7	-.384	1	8	5	7	5	0															
8	-.065	5	0	5	4	8	9	0														
9	-.223	8	0	5	4	0	5	7	0													
0	-.169	4	1	8	1	2	1	4	1	0												
1	.273	5	5	1	1	9	1	8	8	1	0											
2	-.140	9	7	0	7	8	8	8	8	8	1	0										
3	-.096	0	5	5	8	8	5	7	5	0	0	1	0									
4	.084	0	5	2	7	0	4	0	8	2	2	8	7	0								
5	-.060	5	7	8	0	0	7	0	8	7	5	2	7	8	0							
5	.065	9	0	4	2	0	8	7	4	0	8	9	6	8	1	.000						
7	.528	2	8	8	0	2	8	9	7	5	9	8	9	4	8	-.093	.000					
8	.079	5	0	1	0	7	8	5	5	2	2	5	0	0	5	-.117	.092	000				
9	.031	8	0	8	8	1	1	0	7	0	4	5	8	2	5	-.136	.099	533	1.000			
0	.194	5	0	0	0	8	0	2	8	9	5	2	5	4	5	-.038	.303	355	.560	.000		
1	.257	5	5	2	0	5	0	5	8	5	7	1	1	1	7	-.070	.303	440	.493	.826	1.000	
2	.108	5	2	4	2	9	0	8	4	5	5	9	4	5	9	-.061	.047	269	-.156	.127	.253	1.000

The correlation matrix shows the correlation between the following variables:

- There is a high correlation between Q1 and Q17. This means that an employee answering positively to the positive contribution of branch managers is most likely to answer positively to the confidence in electronic cards. Thus the positive attitude of the managers is contributing positively to the confidence.
- There is a high correlation between Q3 and Q4. This means that an employee answering positively to the question regarding the level most affected by IT is teller, is most likely going to answer positively to the question regarding the level most affected by IT is CSO.
- There is a high correlation between Q12 and Q18, 19, 20, 21. This means that an employee answering negatively to the fear of customers to use dematerialized money, will most probably answer positively to the positive relationship between income and card usage, the importance of the service obtained from the card, the importance of the ease in acquiring a card and the importance of the length of the process in choosing a card.
- There is a high correlation between Q18 and Q19. This means that an employee answering positively to the question regarding a positive relationship between income and card usage, is most likely answering positively to the question regarding the importance of the factor of service obtained in choosing a card.
- There is a high correlation between Q20 and Q21. This means that the question regarding the importance of ease in acquiring a card is related to the importance of the length of the process in choosing a card.

Correlation Matrix regarding the performance of Bank A.

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q1
Q1	1.000																		
Q2	-.208	1.000																	
Q3	-.531	.598	1.000																
Q4	-.164	.196	.624	1.000															
Q5	-.150	.118	.198	-.142	1.000														
Q6	.452	-.396	-.518	.197	-.062	1.000													
Q7	-.366	.230	.477	.082	.842	-.307	1.000												
Q8	.350	.215	.073	.376	.215	.454	.218	1.000											
Q9	.013	.108	.276	.258	.343	.156	.336	.673	1.000										
Q10	.270	-.697	-.664	-.247	-.362	.318	-.303	.039	-.108	1.000									
Q11	-.028	.036	-.099	-.145	.273	-.035	.359	.205	.156	.076	1.000								
Q12	-.057	.269	.153	.196	.213	.009	.458	.505	.317	.023	.826	1.000							
Q13	-.328	.031	.405	.467	.005	-.055	.207	.015	-.021	-.046	-.406	-.148	1.000						
Q14	-.531	-.291	.189	.160	.284	-.149	.546	-.192	-.105	.102	.381	.376	.405	1.000					
Q15	-.180	-.091	.172	-.125	.173	-.255	-.018	-.288	.194	-.286	.022	-.348	-.216	-.062	1.000				
Q16	-.131	-.018	-.046	-.271	.322	.032	.009	-.256	-.027	-.280	.236	-.122	-.352	-.140	.562	1.000			
Q17	.038	-.166	-.296	-.459	-.136	-.018	-.444	-.415	-.309	.130	-.197	.519	-.232	-.403	.341	.635	1.000		
Q18	-.289	-.120	.407	.318	.300	-.013	.314	.307	.505	-.032	-.051	.050	.082	.096	.366	.315	.068	1.000	
Q19	-.328	-.201	.230	-.185	.045	.592	.074	.830	-.019	-.014	-.037	-.341	.046	.230	.768	.332	.320	.378	1.00

The correlation matrix shows the correlation between the following variables:

- There is a high correlation between Q1 and Q3. This means that the employee answering negatively to the question regarding the decrease in the cost of labor after the introduction of technological innovations is most likely to answer positively to the question about technology enables the bank to overcome growth barrier.
- There's a high correlation between Q2 and Q10. Employees answering positively to the question regarding technology enables the bank to overcome geographical barriers, is most likely to answer negatively to the question regarding technological innovations are decreasing the amount of man power needed to operate the branch.

- There is high correlation between Q5 and Q7. This means that an employee answering positively to the question that the bank is gaining competitive advantage due to its advance in technology in terms of increased market share, most probably will answer positively to the question regarding the bank is gaining a competitive advantage due to its advance in technology in terms of increased capital.
- There is a high correlation between Q8 and Q9. This means that an employee answering positively to the question regarding the improvement of information exchange between employees and units due to technological advance, will most likely answer positively to the question regarding the decrease in transaction time due to faster information exchange.
- There is a high correlation between Q11 and Q12. This means that the increase in business performance is contributing positively to an increase in the overall productivity of the bank.

The Correlation Matrix regarding the performance of Other Banks

In this correlation analysis, we had to delete the last five questions and one case from the questionnaire of Other Banks, again because of the presence of N/A values. We continued our analysis with the remaining questions.

	Q1	*Q2*	*Q3*	*Q4*	*Q5*	*Q6*	*Q7*	*Q8*	*Q9*	*Q10*	*Q11*	*Q12*	*Q13*	*Q14*
Q1	1.000													
Q2	.259	1.000												
Q3	.467	.419	1.000											
Q4	.402	-.335	.460	1.000										
Q5	.014	.133	.207	-.113	1.000									
Q6	.191	-.529	-.014	.457	.502	1.000								
Q7	.432	.025	.238	.204	.569	.567	1.000							
Q8	-.296	.171	-.154	-.351	.264	-.144	-.309	1.000						
Q9	-.578	-.061	-.512	-.492	.268	.051	-.110	.557	1.000					
Q10	.025	-.527	.020	.589	-.012	.666	.057	-.173	-.175	1.000				
Q11	-.117	-.037	-.093	-.318	.355	.094	.145	.421	.335	-.108	1.000			
Q12	-.069	.126	-.054	-.258	.289	.078	.476	.113	.196	-.201	.659	1.000		
Q13	-.126	.072	.086	-.125	-.123	-.219	.129	-.445	-.321	-.184	.086	.443	1.000	
Q14	.372	-.305	.217	.501	-.054	.419	.359	-.365	-.363	.310	-.007	.133	.386	1.000

The correlation matrix shows the correlation between the following variables:

- There is a high correlation between Q1 and Q9. This means that the employee answering negatively to the question regarding "technological innovations decreased the cost of labor", will most likely answer positively to the question regarding the decrease in transaction time due to faster information exchange.
- There is a high correlation between Q2 and Q10. This means that an employee answering positively to the question regarding "technology enables the bank to overcome geographical barriers", will most likely answer negatively to the question regarding technology decreases the amount of man power needed to operate the branch.
- There is a high correlation between Q4 and Q10. This means that an employee answering positively to the question "technology enabled the bank to overcome cost saving", will likely answer positively to the question regarding the decrease in man power needed to operate the branch.
- There is a high correlation between Q11 and Q12. This means that the increase in business performance is also contributing to an overall increase in productivity.

Correlation Matrix for the combined data for Bank A and Other Banks

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Q1	1.000													
Q2	.053	1.000												
Q3	-.014	.487	1.000											
Q4	.153	-.125	.529	1.000										
Q5	-.055	.086	.195	-.125	1.000									
Q6	.235	-.452	-.277	.335	.213	1.000								
Q7	-.004	.099	.366	.133	.749	.123	1.000							
Q8	-.138	.204	-.063	-.077	.178	.132	-.058	1.000						
Q9	-.393	.009	-.174	-.219	.262	.122	.094	.609	1.000					
Q10	.146	-.603	-.312	.229	-.137	.486	-.096	-.126	-.161	1.000				
Q11	-.142	.006	-.101	-.230	.284	.090	.256	.390	.304	-.046	1.000			
Q12	-.110	.177	.028	-.085	.239	.094	.449	.272	.259	-.118	.729	1.000		
Q13	-.139	.023	.230	.088	.000	-.151	.181	-.340	-.248	-.077	-.144	.197	1.000	
Q14	-.004	-.260	.172	.383	.059	.258	.389	-.193	-.219	.196	.180	.243	.294	1.000

The correlation matrix shows the correlation between the following variables:

- There is a negative correlation between Q1 and Q9. This can be explained by the employees negative answers to the decrease in labor cost after the introduction of IT and there positive answers to the decrease in transaction time due to faster information exchange.
- There is a negative correlation between Q2 and Q10. This means that employees answering positively to the question regarding "technology enabled the bank to overcome geographical barriers" will most likely answer negatively to the question regarding "technological innovations are decreasing the amount of man power to operate a branch".

- There is a high correlation between Q11 and Q12. This is explained by the increase in business performance due to IT and the contribution of IT to an overall increase in productivity.

3.5 REGRESSION ANALYSIS

Our next step was to perform a regression analysis to study the effect of the use of IT on the performance of the banks. In order to do so, we can consider the independent variables related to use, and the dependent variables related to performance. This will be the basis for our regression analysis. The correlation Matrix will help in determining whether the independent variables are actually independent.

First, we study the effect of the use of IT on labor cost. This is done by constructing a regression equation where the dependent variable is the first variable in performance, which is the cost of labor. When running the regression analysis, we obtained a message from the computer output that the regression cannot be calculated, check for singular matrix and variables with zero variance. This means that some of the independent variables are actually dependent. We need to select a smaller set of independent variables using the correlation matrix. From that matrix, we could see that Q1 is highly correlated with Q3, Q7, Q8 and Q17. These questions will be removed from our analysis.

We moved to the next remaining question which is Q2 and we could see that it is correlated with Q16 and Q22. We also removed these questions from the set.

We moved to the next remaining question, which is Q3 and continued in this manner. We were left with 9 questions: Q1, Q2, Q3, Q6, Q9, Q12, Q13, Q15 and Q18.

Rerunning the regression test with the remaining questions as the independent variables, we obtained the following output.

R^2	0.455		
Adjusted R^2	0.209	n	30
R	0.674	k	9
Std. Error	0.777	Dep. Var.	**The cost of labor activity decreased after the introduction of technological innovations**

ANOVA table

Source	*SS*	*df*	*MS*	*F*	*p-value*
Regression	10.0803	9	1.1200	1.85	.1201
Residual	12.0864	20	0.6043		
Total	22.1667	29			

Regression output					*Confidence interval*	
variables	*Coefficients*	*std. error*	*t (df=20)*	*p-value*	*95% lower*	*95% upper*
Intercept	2.2309	1.6121	1.384	.1817	-1.1319	5.5937
Branch managers contribute positively to technological innovations	-0.0711	0.1955	-0.363	.7201	-0.4789	0.3368
The bank's employees reacted positively to technological innovations	-0.2302	0.3387	-0.680	.5046	-0.9368	0.4764
The organizational level most affected by the changes caused by technological innovations is Teller	0.0396	0.1916	0.207	.8382	-0.3600	0.4393
The organizational level most affected by the changes caused by technological innovations is top management	0.3477	0.2231	1.559	.1347	-0.1176	0.8130
The level most hostile to these changes is manager/Assistant Manager	-0.1421	0.2233	-0.636	.5317	-0.6078	0.3236
Customers are afraid of using dematerialized money	0.4101	0.2242	1.829	.0824	-0.0576	0.8778
Are ATMs being used outside the bank's official opening hours	0.2381	0.4233	0.562	.5801	-0.6449	1.1210
Electronic cards are used as payment cards	0.0124	0.4771	0.026	.9795	-0.9828	1.0076
You noticed a positive relationship between income and cards usage	-0.3026	0.3409	-0.888	.3853	-1.0136	0.4085

The independent variables are:

- Positive contribution of branch managers to IT
- Positive reactions of employees to IT
- The Effect of IT on Teller
- The Effect of IT on Top Management
- The Effect of IT on Managers
- Fear of dematerialized money
- Use of ATMs outside the bank's official opening hours
- Use of electronic cards are payment cards
- Positive relationship between income and cards usage

The dependent variables are:

- Decrease the cost of labor
- Overcome Geographical barriers
- Overcome Growth barriers
- Overcome Cost saving
- Competitive advantage in terms of Increased market share
- Competitive advantage in terms of Increased Profit
- Competitive advantage in terms of increased capital
- Faster information exchange between employees / units
- Decrease in transaction takes due to faster information exchange
- Decrease the amount of man power
- Increase business performance

- Increase in productivity
- Decrease in the congestion inside the branch
- More business activity is taking place
- Online banking was capable of reaching enough customers
- Online banking has increased the bank's security measures
- Technological advances have required a higher level of technological expertise
- Technological innovations are helping in the harmonization within the bank's different departments
- Decreased work done inside the branch

In the following table we list the P-values obtained from the regression test analysis for each of the dependent variables.

Questions	P-Value
The cost of labor activity decreased after the introduction of technological innovations	.1201
Technology enabled your bank to overcome Geographical Barriers	.0008
Technology enabled your bank to overcome Growth barriers	.0008
Technology enabled your bank to overcome Cost saving	.0220
The bank is gaining competitive advantage due to its advance in technology in terms of Increased market share	9.54E-06
The bank is gaining competitive advantage due to its advance in technology in terms of Increased Profit	.0001
The bank is gaining competitive advantage due to its advance in technology in terms of increased capital	1.11E-07
Information exchange between employees / units has improved due to technological advance	.0001
A decrease has occurred in the time that each transaction takes due to faster information exchange	.0001
Technological innovations are decreasing the amount of man power needed to operate the branch	.0095
Technological innovations are increasing business performance	.0002
Technological innovations are contributing to an overall increase in productivity	.0007

Due to ATM usage, a decrease in the congestion inside the branch was noticed	.1782
More business activity is taking place because of the use of cards	.4523
Online banking was capable of reaching enough customers to make this innovation profitable to the bank	.0318
Online banking has increased the bank's security measures	.0382
These technological advances have required a higher level of technological expertise	.0115
These technological innovations are helping in the harmonization within the bank's different departments	1.73E-12
Using online banking has decreased work done inside the branch	.0066

From this ANOVA table, we see that the P-value for Q1 (cost of labor) is 0.12. This value is not highly significant. This means that our independent variable related to the use of IT does not have that great of an impact on the cost of labor.

However, the test was significant for the dependent variables for Q2, Q3, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q18 and Q19.

This is an indication that the use of IT has great impact on:

- Geographical barriers
- Growth barriers
- Increased market share
- Increased profit
- Increased capital
- Information exchange
- Transaction time
- Man power
- Business performance
- Productivity

- Harmonization
- Inside work

Running the regression test on Other Banks, we also found highly correlated questions. These questions were removed from our analysis. The test was redone on the remaining questions: Q1, Q2, Q3, Q5, Q8, Q11, Q13, and Q16. The results are given in the following table:

Questions	**P-Value**
The cost of labor activity decreased after the introduction of technological innovations	.0507
Technology enabled your bank to overcome Geographical Bariers	.0186
Technology enabled your bank to overcome Growth barriers	.3431
Technology enabled your bank to overcome Cost saving	9.60E-07
The bank is gaining competitive advantage due to its advance in technology in terms of Increased market share	.0032
The bank is gaining competitive advantage due to its advance in technology in terms of Increased Profit	4.08E-06
The bank is gaining competitive advantage due to its advance in technology in terms of increased capital	1.85E-09
Information exchange between employees / units has improved due to technological advance	.0506
A decrease has occurred in the time that each transaction takes due to faster information exchange	.0022
Technological innovations are decreasing the amount of man power needed to operate the branch	.0029
Technological innovations are increasing business performance	1.77E-07
Technological innovations are contributing to an overall increase in productivity	3.85E-07
Due to ATM usage, a decrease in the congestion inside the branch was noticed	.0307
More business activity is taking place because of the use of cards	8.48E-09

We noticed from the P-value for the first regression analysis, where the independent variable is the cost of labor that the result is 0.05. This means that the test is significant, which indicates that for Other Banks, the use of IT has a significant impact on labor cost. The result gives us an indication that Bank A has been using IT for a long time; this is why the effect of the use of IT did not show on the cost of labor.

The test was also significant for the dependent variables for Q4, Q5, Q6, Q7, Q9, Q10, Q11, Q12, and Q14.

This is an indication that the use of IT has great impact on:

- Cost of labor
- Cost savings
- Increased market share
- Increased profit
- Increased capital
- Decrease in transaction time
- Decrease the amount of man power
- Increased business performance
- Increased productivity
- More business activity

4 SUMMARY AND CONCLUSION

In this thesis, we studied the effect of information technology on the banks performance. This was done by studying the first bank (Bank A), which is considered one of the biggest banks in Lebanon and which we used as a benchmark, comparing it to five other Lebanese banks that have been using information technology more recently. Questionnaires were collected from the different banks. The results were analyzed using various statistical techniques such as hypothesis testing, correlation and regression analysis. We can conclude the following:

- All banks in Lebanon are using IT effectively. This is based on the analysis done on testing proportions regarding the use of Bank A and Other Banks.
- Some banks are using IT more effectively than others and some have been using IT for longer periods than others. This is based on the analysis of comparing proportions.
- The effective use of IT has positive impact on the performance. This is based on the correlation and regression analysis.

The impact of using IT on performance differs among the various banks in Lebanon. The use of IT has great impact on:

- Increased market share, profit and capital
- Decrease in transaction time and amount of man power
- Increased business performance and productivity

The impact of the effective use of IT on Banks that have been using IT for longer periods was shown on:

- Geographical and growth barriers
- Market share, profit and capital
- Information exchange
- Transaction time
- Man power
- Business performance and productivity
- Harmonization

The areas where the impact is greater for banks that have been using IT more recently:

- Cost of labor
- Cost savings
- Market share, profit and capital
- Transaction time and amount of man power
- Business performance, productivity and business activity

5 BIBILIOGRAPHY

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APPENDIX A

QUESTIONNAIRE

This survey is about the use of technological innovations in the banking industry in Lebanon. The questionnaire below will serve to collect data and feedback about information technology impact on the banks, the way you perceive it. The questions will take twenty minutes from your time, and all responses will be kept confidential, their use is strictly for educational purposes.
We thoroughly appreciate your help.

Position: _____

Years of Experience in the Bank: _____

Scale used in this survey:

- **Strongly disagree** **1**
- **Disagree** **2**
- **Neutral** **3**
- **Agree** **4**
- **Strongly agree** **5**
- **Not Applicable or Don't know** **N/A**

I. THE TECHNOLOGIES USED BY YOUR BANK ARE:

(Circle all that applies)

1. Automated Teller Machines
2. Electronic cards
3. Online Banking _____(Pleased indicate a percentage if available)

II. CHANGES BROUGHT BY INFORMATION TECHNOLOGY

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Applicable
1. The cost of labor activity decreased after the introduction of technological innovations.	1	2	3	4	5	N
2. Technology enabled your bank to overcome barriers:						
A- Geographical barriers	1	2	3	4	5	N
B- Growth barriers	1	2	3	4	5	N
C- Cost saving	1	2	3	4	5	N
3. Branch managers contribute positively to technological innovations.	1	2	3	4	5	N
4. The bank's employees reacted positively to technological innovations.	1	2	3	4	5	N
5. The organizational level most affected by the changes caused by technological innovations is:						
A- Teller	1	2	3	4	5	N
B- Customer Service Officer	1	2	3	4	5	N

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Applicable
C- Manager/ Assistant Manager	1	2	3	4	5	N
D- Top Management	1	2	3	4	5	N
6. The level most hostile to these changes is:						
A- Teller	1	2	3	4	5	N
B- Customer service officer	1	2	3	4	5	N
C- Manager / Assistant Manager	1	2	3	4	5	N
D- Top Management	1	2	3	4	5	N
7. The bank's customers are adopting new innovations introduced by the bank.	1	2	3	4	5	N
8. The bank is gaining competitive advantage due to its advance in technology in terms of:						
A- Increased market share	1	2	3	4	5	N
B- Increased profit	1	2	3	4	5	N
C- Increased capital	1	2	3	4	5	N
9. Information exchange between employees / units has improved due to technological advance.	1	2	3	4	5	N

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Applicable
1	2	3	4	5	N
1	2	3	4	5	N
1	2	3	4	5	N
1	2	3	4	5	N

10. A decrease has occurred in the time that each transaction takes due to faster information exchange.

11. Technological innovations are decreasing the amount of man power needed to operate the branch.

12. Technological innovations are increasing business performance.

13. Technological innovations are contributing to an overall increase in productivity.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Applicable
1	2	3	4	5	N
1	2	3	4	5	N
1	2	3	4	5	N
1	2	3	4	5	N
1	2	3	4	5	N
1	2	3	4	5	N

III. AUTOMATED TELLER MACHINES

1. Customers are afraid of using dematerialized money.
2. Due to ATM usage, a decrease in the congestion inside the branch was noticed.
3. ATMs being used outside the bank's official opening hours
4. People are using the bank's ATMs to withdraw money in places other than the bank's branches.
5. Is there a relationship between age and ATM usage? If you agree which age group uses ATMs more? (Please circle below)

< 20	20- 40	40-60	60-80	> 80

IV. ELECTRONIC CARDS

1. Electronic cards are used as payment cards.
2. The amount of checks decreased due to payments done by using cards.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

3. There has been enough confidence in electronic cards.

4. Based on your experience what is the major limitation for using these cards? (Habit, mentality, availability…)

   _____

   _____

   _____

   _____

5. You noticed a positive relationship between income and cards usage.

6. According to your observation, the most important factor in choosing a card is:

   A- Services obtained from the card

   B- Ease in acquiring the card

   C- Length of the process

   D- Interest rate, annual fees

7. More business activity is taking place because of the use of cards.

V. ONLINE BANKING

1. Customers mainly use online banking for:

   A- Transaction

   B- Transfer

C- Statement Checking

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Applicable
	1	2	3	4	5	N
2. Online banking was capable of reaching enough customers to make this innovation profitable to the bank.	1	2	3	4	5	N
3. The customer's biggest fears for using online banking are: _____ _____ _____ _____						
4. Online banking has increased the bank's security measures.	1	2	3	4	5	N
5. These technological advances have required a higher level of technological expertise.	1	2	3	4	5	N
6. These technological innovations are helping in the harmonization within the bank's different departments.	1	2	3	4	5	N
7. Using online banking has decreased work done inside the branch.	1	2	3	4	5	N

VI. OTHER RELEVANT QUESTIONS

1. Was your bank required to change its internal structure in order to successfully introduce IT? How?

2. Which technological breakouts (ATMs, Electronic Cards or Online Banking) have had the most effect on your work? In what way did it affect productivity and work performance?

3. How did the development of new technologies reduce the importance of 'traditional' banking?

4. Is your bank preparing its staff for getting adapted to these ongoing changes in technology? In terms of systems? Databases and trainings? Describe.