

# Technological Transition of Banks for Development: New Information and Communication Technology and Its Impact on the Banking Sector in Lebanon

Maria Hilal<sup>1</sup>

<sup>1</sup> Faculty of Business, Université Antonine, Beirut, Lebanon

Correspondence: Maria Hilal, Finance Department, Faculty of Business, Université Antonine, Hadath-Baabda, B.P. 40016, Lebanon. Tel: 961-76-813-815. E-mail: maria.hilal@upa.edu.lb

Received: February 3, 2015

Accepted: March 4, 2015

Online Published: April 25, 2015

doi:10.5539/ijef.v7n5p186

URL: <http://dx.doi.org/10.5539/ijef.v7n5p186>

## Abstract

The banking industry has been facing many challenges during the last decade. One of these challenges is the technology transmission in its overall processes, not only in the implementation and processing of financial innovation operations like securitization newly learnt today in the banking industry in Lebanon, but also in the transition towards innovation in the internal way of working of these banks. New information and communication technology has been integrating the indirect financial system to fasten, empower and ease access to all users. It is a tool which impact has not been yet addressed by researchers and that is interesting to investigate in this survey.

Consequently, two core questions narrow the research question. The first is: what are the opportunities and motivations of Lebanese commercial banks behind implementation of NICTs? The second question is: what are the effects of NICT on the production function, on the distribution function and on the productivity function of these banks?

After defining in the conceptual part the banking businesses and their evolution, we will study the impact of technological change on the functioning of the bank. The second part is devoted to empirical validation through which two qualitative questionnaires are analyzed. The main purpose of this paper is to analyze first the changes and mutations of the various professions of the bank through technological transition and second to measure technological performance of Lebanese Commercial Banks. Our investigations confirm that new technologies play an important role in the development of the banking industry, strengthening their profitability and improving their productivity.

**Keywords:** new information and communication technology, banking industry, production, distribution, productivity, questionnaire

## 1. Introduction

### 1.1 Introducing the Problem

Research on the impact of new information and communication technologies (NICT), and networks in particular, on the banking sector started in the seventies: it has already led to two different improvements in banks. First, technology supported logistically the internal processing of information and networks within the industry by developing interbank networks. Second, NICT-based new systems fastened the access to capital markets, enabled the creation of global electronic markets and modernized stock exchange markets. Today, technology is used to support commercial work at agencies and to develop new distribution channels especially through the use of Internet. However, Internet is not only a new channel of distribution embedded on the pre-existing channels: it influences the evolution of the bank profession and endorses the separation between manufacture and distribution of banking products.

### 1.2 Research Objectives

This paper examines effects of technological progress, expressed in different forms or examples: Internet banking which is relatively a new front-office technology for banks, Electronic payment technologies that are switch paperwork and another new front-office technology, and Information exchanges with third parties as a

new back-office technology used for evaluation of customers and their loan applications (Note 1).

The main purpose of this study is to show the impact of technological progress on three levels: on the production level, on the distribution level and on the productivity level of commercial banks in Lebanon—a subject that hasn't yet been addressed. Our interest resides in the fact that the banking industry in Lebanon plays a crucial role in supporting productive sectors and business activities especially that the country has been facing during the last recent years instability and inefficiency in the political environment and the economy is still disrupted by the conflicts of neighboring Syria. The banking sector in Lebanon has been alone moving across the vulnerable situation and heading towards development and better productivity. Thus, it is interesting to show how banks improve their performance within the framework of technological progress.

### *1.3 Research Contributions*

Hence, in the strict order of this paper, we begin in the theoretical part by exposing the evolution of banking businesses and banking models as well as presenting effects of technological change on the functioning of the bank. The practical part will be validating results attached to two questionnaires analyzing technological transition and performance of Lebanese Commercial Banks: the first qualitative questionnaire is addressed to the General Management and the Information Technology Management of Lebanese commercial banks, and the second to banks using information technology tools: “front-office” and “back-office” technologies, ATMs, Internet banking, and other electronic transactions.

## **2. Literature Review**

### *2.1 Evolution of Banking Businesses*

A business can be defined as “the ability to manage a supply system, which is a set of tasks offering to a customer a product or a service” (Sahut, 2013). This involves not only having the skills and the resources needed to perform specific tasks, but also the ability to articulate contributions of various origins. However, when managers try to define their business, they refer either to the market or to the sector or to their positioning. “The business is then defined as the meeting of the supply and the demand with the need to integrate the external and internal analysis of the firm” (Sahut, 2013).

Based on this definition, businesses exercised by a bank are brought together in three different categories: financial intermediation, intermediation in the management of the means of payments and selling products (Note 2).

The first function of the bank is the intermediation between lenders and borrowers (Note 3). The bank pays deposits a certain amount that varies from a country to another, lends money to its customers and makes them pay interest costs. The difference between the average rate of lending and the average rate of crediting is the interest margin that contributes in the formation of the added value of the banking business.

This function has faced the opening of the financial markets and has caused the bank to lose a part of its privileged positions. Firms turned to the market to finance their activities and therefore less to intermediated finance. We are still witnessing the development of direct finance.

Based on a study of Saidane D. (2001), “the intermediation process has changed in nature and the rates of financial intermediation declined over the last twenty years”. But this does not modify the essential role of the bank which is to provide today the economy with expertise concerning financial risk management. The bank's activity consists more in intermediating market transactions (purchase and sale of securities, settlement operations, securities conservation), in performing financial engineering transactions (IPO: Initial public offering, capital increase and capital restructuring, etc.), in managing market risks for its own behalf and on behalf of third parties (private management, salary savings, etc.).

This disintermediation is hardly perceptible for intermediate size clients. The problem for banks is to treat funding for these firms at an acceptable cost. To do this, banks develop back-office functions and rely on risk analysis methodologies (such as scoring) acquired through consumption loans and leasing to individuals. Thus, the client's contact stays customized and implemented within the network.

Like financial intermediation, intermediation in the management of the means of payments is also perched for a deregulation of markets. Other intermediaries benefit from the rise of e-commerce to compete with banks privileges in managing means of payments. The increase in the use of means of electronic payments on the Internet has a double impact on the banking industry. First, it changes the organization and the management cost of the traditional means of payments—if substitution effects occur for the benefit of these new payment methods—resulting in less use of checks, bills and coins. On the other hand, this sharing activity between banks and

non-bank players depend largely on technology and regulation (rules of evidence, the electronic signature, status of institutions running these payments methods) that will be required on the Internet.

Waning in the rate of intermediation in financing the economy affects banking activities: banks are becoming increasingly sellers of financial products. In this context, the role of NICT is decisive as it transforms the relationship between banks and their customers. After being in a first phase a support to management account receivables and sales in the agency, NICT participates today in enriching services offered by banks to develop a variety of benefits:

Clients are able today to access and conduct transactions anywhere and anytime (24/24 hours and 7/7 days) and receive information instantly and punctually. This was previously reserved to the institution.

Banks have today a better understanding of the client (behavior, needs and attached risks). This has increased their opportunity of selling personalized products and services and increased their “chalandise” area.

These advantages have led to the emergence of new remote sales channels and in particular on the Internet. In summary, NICTs play an increasing role in the evolution of the banking businesses. Moreover, NICTs are modifying the grounds of competition between banks. They are also integrating non-banks players into the competition. It is clear that leads will belong to those who will understand the potential of change related to new technologies and implement it to generate real competitive advantages.

### *2.2 Evolution of Banking Models*

Banking businesses as presented in the previous section help us to understand better diverse bank models detailed by Llewellyn (2010, 2011) in his stylized review. One of the most powerful pressures influencing transition and evolution of the bank’s business models according to Llewellyn (2010) is technology.

The basic bank model and the most dominant one for decades is the traditional bank model. The core function of this model is the financial intermediation function. In this traditional understanding of the bank, credit risk cannot be released or covered and banks are sheltered in their loan portfolios: banks accept deposits and use their comparative advantages—information, risk analysis and monitoring—to transform them into loans and to resolve problems of asymmetric information.

New bank models focused on financial innovation to set a better regulatory framework on the credit risk management through two vital business strategies: securitization of loans and credit derivatives of loans (CDs) as means to alleviate and control credit risks. It was no longer a function concentrated on accepting the risk and working on monitoring trying to alleviate it internally. These new bank models have a function concentrating on shifting the risk and insuring it through off-balance sheets operations. Llewellyn (2011) and Roux (2013) emphasized these models as pre-crisis bank models.

However, credit-risks shifting did not endure as long as expected: banks were faced to many changes in risks’ nature and therefore each business banking model has been transformed according to its risks characteristics and relative performance. For instance, Retail banks appeared to be less precarious, holding more liquidity and using less risk-shifting instruments; Investment banks had less stable funding sources but were highly levered and heavily tied to trading activities.

After the financial crisis, regulation created less complex bank models: on the international level, Basel III recommended higher capital regulatory requirements, therefore squeezing the profitability of banks coming from trading activities. On the European level, in 2012, the Liikanen report (Note 4) recommended a separation between proprietary trading and high risk trading for commercial banks and a reinforcement of capital requirements on trading assets and real estate lending. The same recommendations were re-addressed in January 2014. Thus, regulatory decisions can have important implications for future banking business models in the world.

### *2.3 Effects of Technological Change on the Functioning of the Bank*

Effects of technological change on the functioning of the bank has been studied in many countries by several researchers: Webster (1997) examined the relationship between technological change and the bank performance and found a positive significant relationship. He also explained that the higher the level of technological change the higher is the profitability of the bank. Berger (2003) proved through his study that technological progress helps the banking industry through its geographical expansion and facilitates it by reducing distant-related agency costs both on the national and international level of expansion. His study was concentrated on US banks.

According to Mizrahi (2000) the convergence of Internet banking and mobile networks within the bank functioning creates both opportunities and threats. His paper discussed this issue for a small sample: a Tunisian

bank. Casolaro (2007) analyzed the effects of investing in information technology on the productivity of the Italian banking sector. He found that banks embracing IT capital-intensive techniques are nearer in average to the top functioning of the banking industry and this would result in a high rate of efficiency. More recently, Frame and White (2009) studied the effects of technological change and found that financial innovation can improve social welfare and efficiency of banks. This was proven for the past 25 years for US banks also.

Within the Lebanese framework, many researches have been accomplished but were oriented to diverse practical studies and concentrations: Azzam (2010) for example studied the effects of NICT on the bank's marketing strategy in Lebanon and explained that new information and communication technologies, globalization and the internationalization of markets have dramatically transformed the economies of the twentieth and twenty-first centuries, and therefore modern managerial marketing approach. The impact of new technologies (Internet or other) has significantly transformed the banking servicing process and all marketing strategies. Distribution channels (ATMs, bank accounts websites, smartphones) are developed to become real smart computer media that interact with customers and facilitate all types of banking transactions. But Azzam did not mention anything about future research orientations towards effects on the whole functioning of the bank.

Toufaily (2004) emphasized the impact of electronic banking on the organizational performance of the banking sector in Lebanon using a qualitative questionnaire personally administrated dealing with official banks listed by the Lebanese Banks Association and concluded that operating banks in Lebanon adopting e-banking innovation succeeded in developing quality of products and services offered to their clients. Also the global cost of the bank has been reduced and the commercial relation with the clients has been enhanced and became more valuable. The study was made two years after effective implementation of e-banking innovations by banks in Lebanon, and this affected the performance results especially that the organizational performance outcomes are observed at least after three years of e-banking adoption as Toufaily underlined in the limits of her study.

Overall, it appears that NICT disrupts the functioning approach of banks in terms of production, distribution, organization and productivity in many ways:

### 2.3.1 At the Production Level

In this area, banks are using NICTs to achieve together the following three objectives: decreases in the production costs, industrialization of processes and transition to a management of flows.

The pool of activities in the banking field concerns mainly payments, loans and investment securities. This allows banks to group their investments and to achieve economies of scale (by spreading fixed costs over larger dimensions). However, another characteristic is more specific to NICT: NICTs permit meaningful increases in the production capacity of banks. The increase in the processing capability is faced by the problem of its use in order for banks to remain competitive in terms of costs. Therefore, the solution is to find new channels for extra set capacities by creating new products or by exporting them to competitors. In fact, the mutuality of certain activities is no longer considered as a last alternative, but as a real strategic choice.

The second objective of banks is to achieve automation and industrialization in their overall process. If some tasks have been automated, the path for traditional banks will be long. Before achieving this goal, physical management records is a major handicap for speed treatment and the competitiveness of banks networks. Automatic processing of the back-office and immediate customer access require to have a global, unique and immediate perception of each client. Similarly, the management of middle clients usually requires a face to face relationship and a manual processing. But industrialization processing is necessary for the back-office in order to handle these records at acceptable price levels. This challenge is even more important that through growing disintermediation, banks need to expand their client targeting to smaller companies.

Finally, NICTs modify banking management by developing transition from a traditional management of stocks to a management of flows which means the monitoring and control of trade with a double effort: integrating operations from A to Z and their continuous treatment. In fact, in most of their operations, such as market operations or operations in request for payment authorization by credit cards, banks have not the ability to select operations unless gradually as they incur. Thus, the risk management is part of intervals getting shorter. It shows the bank as an information manager whose function and criterion of performance is to collect, process and transform information.

### 2.3.2 At the Distribution Level

The greatest effect when considering the impact of NICT on banks is that on their distribution. "Excellence in channel management will be a source of competitive advantage for market share and value creation" (Gueret & Kunstler, 2000). Affected by the shock wave of internet, banks are experiencing virtual change. Reducing

operations cost, managing customers relationship, selling online products and the risk of new entrants are all big challenges.

First, Internet allows a drastic reduction in the banking operations costs. According to the cabinet study Booz Allen and Hamilton, the unit cost of an operation is one euro at an agency level, 0.5 euros per phone, 0.25 euros in ATM banking and 0.12 euros on the internet. This can be explained by the very low fixed cost associated to this channel. Internet also authorizes the transfer to clients of the administrative management of their accounts, becoming a non-profitable service for the institutions.

On the other hand, NICTs disrupt the management of the clientele relation: Banks became a vehicle for creating personalized offers. Clients use NICTs as a way of comparing the offer at a lower research cost and having an easy access to it.

Initially, banks who are based on the Pareto principle (20% of customers generate 80% of profits) installed standardized banking services primarily for a mass of clients expecting to assist agencies in providing personalized servicing with high level of added-value and stronger potentials in terms of margin. Yet, it is precisely clientele who turned first to Internet. Hence, the offer of traditional banks has proved to be inadequate in terms of wealth and quality, leaving the field open to new entrants. These have addressed the clientele segment with highly targeted products of credit and investment.

In fact, NICT offers the right tools for understanding customers and their needs in a better way. Thus, collecting information from clients and using it (defined as marketing one-to-one) are key elements for selling online products with high added-value. This encourages banks to reorganize their work around the client and more generally to shift from a production to a distribution logic of tasks. "The challenge of competition is the ability to identify and anticipate customer needs and develop distribution models that meet their needs". "...The bank must implement a new development strategy, by organizing its networks and channels, so that each client can choose his way of contact, depending on his specific behavior, whether to establish a relationship or to get a benefit" (Cheteux, 2000). The success of the bank in front of its clients depends on handling changes of its organizational device overall. Indeed, "to keep their place in the economy and the confidence of their clients, banks must begin a mutation affecting their organization" (Mizrahi, 2000).

Each bank strives to offer its clients the most appropriate answers to their demands, in order to optimize the implementation of its internal competencies portfolio. The sum of actions of a bank is therefore written in a double purpose: economic efficiency—that is the source of profit—and the customer satisfaction—which concerns the customers' use of available financial services. The objective covered by the bank in using new technologies is therefore the continuous development of its competitiveness and profitability with being sufficiently innovative to offer its clients the best services and products and thus its competitors.

### 2.3.3 At the Productivity Level

Improving productivity has been always and remains a strategic goal for banks. In a very competitive environment, productivity has become a key element in the process and capacity of banks development. Technological innovations such as advances in heavy computers, telecommunications, microcomputers and more recently development of speech synthesis techniques have changed the framework of exercising the profession of a banker. Technological innovations result in an increase of automation and operations outsourcing, in particular of those related to the network. Automation is the automatic processing of repetitive operations previously performed manually. Outsourcing is the carrying out of transactions outside the traditional network. For instance, cash withdrawals, cash and check deposits, accounts consulting, etc. are made lesser in the agency and increasingly in ABMs (Automatic Banking Machines) and ATMs (Automated Teller Machines).

Effects of networks' automation are relatively unclear. In one hand, they appear positive since, for some operations, they reduce the administrative task of some employees at the agency. But, on the other hand, automation of banking businesses may lead to discharge the network of some transactions processed until today at headquarters. The most patent example concerns new accounts previously transmitted to headquarters for entry and are currently entered directly at the agency. The overall productivity of the bank has improved but at the expense of agencies.

In all cases, effects of outsourcing are positive on the network productivity as it reduces the number of operations that were treated previously within the network. Using productivity gains is the basis of any strategic thinking regarding the development of a network. Overall, effects of automation and operations outsourcing are positive both on the bank and the network's productivities because it reduces the number of employees necessary for the achievement of some operations. If these productivity gains are common to almost all networks, a

fundamental difference persists in their application' strategy: a) Improving productivity by reducing the number of employees gradually; b) Increasing available commercial time by using "time saved" developed commercial operations.

It is interesting to specify the variables and the indicators used by economists and managers as they try to capture the impact of technical change on productivity. Marrakchi (2000) pointed out to the fact that "indicators measuring the impact of technology as a working tool on productivity are unfortunately not available". This is not a specific situation for Lebanon. In fact, the famous saying that "we see technology everywhere except in statistics" is universal and sums up the difficulty.

### **3. Analyzing Technological Transition and Technological Performance of Lebanese Commercial Banks**

#### *3.1 Methodology*

We have formulated the problematic of our research in the following two questions that we will try to answer throughout the questionnaires:

What is the opportunity and motivation of Lebanese commercial banks behind NICT implementation?

What is the impact of this implementation on the performance of Lebanese commercial banks: on the production, on the distribution and on the productivity levels or functions?

#### *3.2 Research Identity*

Taking into consideration the research objectives, our exploration is a descriptive and explicative one: it observes and describes the organizational changes of the banks when adopting NICTs and visualizes different forms of resulting performance.

#### *3.3 Target Population*

The target population gathers small, medium and large operating banks in the Lebanese market having national activities. For the population selection we have contacted the BDL (Banque du Liban), the central bank of the country, who has delivered us an official complete list of operating banks in Lebanon dated December 2013. The list named 70 operating banks (Note 5) including 31 commercial banks, 9 Lebanese banks with Arab control, 1 Lebanese bank with foreign control, 9 Arab banks, 4 foreign banks and 16 investment banks. In addition, we have processed into getting information about each commercial bank through the Directory of Banks (Note 6) published by the Association of Banks in Lebanon (ABL) dated 2014 in order to get addresses, phone numbers and electronic addresses of each of these banks. Our objective was to generalize the study and cover all population of Lebanese commercial banks operating in Lebanon. The target population is then adequate to the time management of the questionnaires: it is constituted of 31 Lebanese commercial banks.

#### *3.4 Structure and Contents of the Questionnaires*

Two different qualitative questionnaires were constituted: the first was addressed to the General Management and the Information Technology Management of Lebanese commercial banks, and the second to banks using information technology tools. Persons surveyed in the banks are those who are decision takers in the implementation process of NICTs within the bank.

Furthermore, we expect that respondents can answer accurately and precisely the questions because their profile has been already determined: they are general managers and IT managers. Consequently, answers are correct.

The first questionnaire is organized in 6 sections with a total of 22 questions: section A analyzing the banking technology implementation has 5 subject questions; section B highlighting analysis of motivations behind implementation of NICTs has 5 subject questions; section C analyzing satisfaction behind the usage of NICTs has 5 subject questions; section D and section E stressing correspondently on the network security and on the development strategy of the IT system went each through 2 questions; and the last section of the first questionnaire, section F analyzing the three pillars of the management cost of the means of payments has 3 essential questions and other sub-questions.

The second questionnaire is organized in 3 sections with a total of 18 questions: section A highlighting the effect of technology on the production function has 5 questions; section B focusing on the impact of NICTs on the distribution function has 5 questions; and section C analyzing the impact of technology on the productivity function has 8 questions.

The main objective of the questionnaires is first to analyze transformations of the diverse functions of the Lebanese banks and second to measure their technological performance since no figures or variables in any reports indicate or mention these.

### 3.5 Data Collection

We have processed by contacting banks by phone. The objective was to organize a meeting with the persons in charge of NICT implementation in each bank to hand them the corresponding questionnaires. We collected answers from general and IT managers after a week of delivering personally the correspondent questionnaires (Note 7).

## 4. Results and Discussion

The following section is devoted to the empirical validation of the pre-developed approach. It consists on analyzing the results of the questionnaires.

### 4.1 Survey Results Developed within General Management and IT Management of Lebanese Commercial Banks

One of the essential conditions for success, productivity enhancement and competitiveness of Lebanese commercial banks is the efficient use of the technological potential that requires organizational change, allows the development of the managing services of the means of payments and expands the range of services offered to clients. However, this involves huge and sustained investment in new technologies.

Consequently, we investigated this issue directly through a questionnaire addressed to Lebanese banks in order to analyze the degree of success in using technology. This analysis could not be possible without such an investigation.

According to answers, the thirty-one studied banks have new distribution channels, as part of the national strategy of modernization recommended by the Central Bank of Lebanon (BDL). Moreover, all these banks have modernized their means of payments through the increase of the number of payment cards. In fact, according to the SGBL (Note 8) Economic News of November 2014, credit card numbers accelerated in the first half of 2014 (Note 9). Additionally, most of Lebanese commercial have logged on the electronic clearing system and have created for this purpose an electronic clearing service. In order to improve their customers' relation and the quality of their services, they invested in remote distribution channels and provided new distribution channels which they consider as the two main components of the development of the bank. In fact, Lebanese banks have today a growing number of ATMs and new services related to the distant bank: the vocal server and the online banking. Furthermore, 100% of banks have hosted a website while 13% of them will be able soon to make accommodation. Also, 72% of banks are the owners of these new technologies while 28% of them have used the association (Note 10) to introduce these innovations because of the high cost of the technology.

#### 4.1.1 Analysis of Motivations

The survey consists on answering the below different proposed choices (Table 1).

These informations were collected using various levels of motivation. And values are ranging from Neutral/None to Medium and High. Results are summarized in the table below:

Table 1. Distribution, in percentage, of the Lebanese banks manager's motivations

Motivations	Intensity degree					Total
	None	Low	Medium	Fairly High	High	
Extend the scope of action of the bank	-	-	-	33%	67%	100.00
Improve exchanges with customers	-	-	-	27%	73%	100.00
Attract foreign customers	-	-	23%	27%	50%	100.00
Improve interbank exchanges	-	9%	27%	36%	27%	100.00
Improve market operations	-	9%	18%	54%	19%	100.00

Based on the results of this table, expanding the bank's scope of action and improving exchanges with customers are the first key motivation displayed by managers of Lebanese commercial banks. Indeed, 67% of managers find that the extension of the scope of action of the bank is a primary reason behind the introduction of new technologies. Also, 73% of managers find that improving exchange with a customer is another essential reason for introducing new technologies.

If technological change creates new opportunities for value-added services, it simultaneously contributes to increasing competition allowing its extension beyond the banking sphere. This strong competition forces banks to revise their strategies and to focus on their specialisms and specifically reach customers who could improve their productivity, with possible economies of scale. Therefore, Lebanese commercial banks seeks to meet the

challenges of competition by mobilizing all their distribution system. This will help to better understand the needs of their customers and to know systematically how to satisfy them.

The introduction of new technologies enables also the pull of foreign customers. In fact, 50% of top managers find that new technologies attract foreign customers. Other factors, namely improving interbank exchanges and market transactions do not constitute a major advantage for the introduction of new technologies because only 27% of managers believe that improving interbank exchanges consists in a high degree of motivation and only 19% found that improving market operations is the main reason for this.

#### 4.1.2 Analysis of Satisfactions

The survey consists on meeting also different choices (Table 2).

Satisfactions translated from the introduction of new technologies are summarized in the following table:

Table 2. Distribution, in percentage, of the Lebanese banks manager's satisfactions

Satisfactions	Intensity degree					Total
	None	Low	Medium	Fairly High	High	
Improving productivity	-	-	-	16%	84%	100.00
Reliability and speed of transactions processing.	-	-	-	27%	73%	100.00
Strengthening profitability	-	-	29%	36%	34%	100.00
Improving the quality of services	-	-	9%	33%	58%	100.00
Customer's loyalty	-	10%	10%	50%	30%	100.00

On one hand, we can see that satisfaction resulting from the introduction of new technology is quite high for most of the respondents. In fact, innovation, modernization and introduction of new technologies are privileged means for improving banks productivity (84%). The reliability and the speed of operations processing (73%) and the development of the quality of services (58%) comes respectively at the second and at the third ranks. But unfortunately, only 34% of surveyed managers' reported a high satisfaction concerning the impact of new technologies on strengthening the profitability of their banks. Why this percentage is accordingly low? It stands because of the high cost of technology and because profitability depends primarily on the intermediation function and increasingly on the financial function where associated risks are evolving.

Customer's loyalty, on the second hand, does not seem to meet the satisfaction of managers. In fact, only 30% of respondents stated a high satisfaction concerning the customer's loyalty. During the investigation, it was noticed that users are not easily adapted to these new technologies. In addition, the spread of computerization and of new high technologies at all levels that are nowadays essential components and a factor of distinctive competence; depend largely on managers' awareness and specifically on continuous trainings. In fact, 91% of banks have today an in-house training program on computers and new technology systems. Furthermore, these programs are not intended anymore only for professionals but incorporates more behavioral aspects and cultural partners. Therefore, real issues lie between two essential key resources for the bank: men and tools. This synergy is a crucial performance factor. Indeed, "technological change does not involve a decrease but an alteration in the training to shift it more into continuous knowledge and expertise, a training alternating frequently shorter actions and focusing more on scenarios" (Karen, 2002).

#### 4.1.3 Network's Security

The computerization of banks provided them with more powerful tools, but at the same time, increased their vulnerability. This is why computerization required a total logical security of banks' networks, whether centralized (54%), decentralized (27%) or both (19%). This security has not escaped the Lebanese commercial banks. In fact, they set up new IT tools and specialized men able to measure, monitor, control, manage and better reduce risks brought by these new technology systems. Banks also shaped a security team and put in place confirmed technical solutions: passwords, anti-virus, etc.

#### 4.1.4 Development Strategy of the IT System

What are the choices to be done within technology? How far should it go? Before questioning their IT strategy, Lebanese commercial banks must define their overall strategy by enquiring the wide diversity of functions they generally carry. Technological choices will then be simplified and better justified. As for the results, 37% of banks adopt a development strategy for their computerized systems according to the modernization criteria and the achievement of economies of scale. Similarly, 37% of banks are based on the criteria of modernization and



wider dissemination of products and services in their development strategy of their computer systems, whereas 26% of the surveyed banks adopt a developing strategy of their computer system under the three development following criteria: achieving economies of scale, ensuring a wider distribution of products and services and modernization.

A good “IT strategy” can certainly help improve these scores. But a good strategy for information technologies is the one that expresses clearly choices and technological changes that designate a specific banking strategy. For this purpose and before deciding whether to introduce a new technology in the banking system, all surveyed banks undertake pre-implementation studies.

#### 4.1.5 Importance of IT Investment

According to the survey’s results, 18% of banks believe they have a mean number of 500 machines of technology processing units (ATMs, microcomputers, printers, scanners, etc.). We can find the double of this number in 46% of banks while 36% of them estimate they have more than 1000 machines. These fairly large numbers require significant investment in technology. The percentage share of these investments – oriented towards computers and networks – relatively to the overall budget of banks is presented in the table below:

Table 3. Share of technological budget in the overall budget (in percentage)

Share of technological budget in the overall budget	Percentage of Banks
Between 10% and 20%	10%
Between 20% and 30%	35%
Between 30% and 40%	55%

As a result, we see that 55% of banks spend between 30% and 40% on technological change relatively to their overall budget. This means that most of surveyed banks are spending mostly on technology. Moreover, these banks plan larger investments in the coming years that could reach a share higher than 50% of the overall budget. In addition, the annual growth rate of IT spending tends to increase and reach 25% for 19% of the banks; 20% for 50% of the banks; 15% for 23% of the banks and 10% for 8% of the banks. Furthermore, surveyed banks did not indicate a decrease in the annual growth rate of IT spending relative to the past years.

#### 4.1.6 Cost of Different Means of Payments

The average unit cost of the payment instrument has two main components:

A direct cost covering a technical component including manufacturing cost, administrative and technical treatment and the cost of effecting staff, etc.

A financial cost including the capital cost, fraud and payment incidents, etc.

The three instruments subject to our investigation are the check, the debit receipt and the payment card. According to the surveyed banks, it was found that the check is the most automated mean of payment (46%) followed by the payment card (36%) and finally by the debit receipts (18%). Thus, two general conclusions can be drawn: the cost of the means of payment declined; more automated a payment instrument is, less higher its average cost is.

#### 4.1.7 Monitoring Performance of the Technology System

“Measurement and comparison of technology’s performance allow its optimization and thus increase the overall profitability of the bank” (Corvoisier, 2001). All banks surveyed are interested in method allowing them to analyze, control, and then by comparison making them improve the performance of their NICT system. This monitoring is done daily (27%), monthly (46%), quarterly (18%) and annually (9%). However, only 9% of the investigated banks find that the performance of their NICT system is good while 91% report having sometimes poor performance due to some handling errors, loading errors and especially to network errors and viruses. Based on the following questions: According to you, is technology being seen as a burden or as a strategic asset to the bank? Generally, is it a gain or a loss? Results of the survey are the following:

Table 4. Banks defining NICT

New Technology of Information and Communication is	Percentage of Banks
A burden	14%
A strategic resource	46%
Generally, it is a gain	40%
Generally, it is a loss	-

Referring to the table, 46% of managers find that technology is a strategic resource to the bank. In fact, according to them, technology is essential and without it the bank cannot function. Technology is the future of the bank. It certainly helps to improve the quality of service offered to customers, to better monitor the activity of the bank, to enable decision makers to make more efficient decision on time and to better manage risks (clients' risks, country risks, currency risks, etc.). Moreover, it allows technicians to improve their knowledge and to act quickly and effectively. 40% of the surveyed managers confirm that technology is a huge gain. They explain that the bank is a "winning combination" between human capacity and technology resources that are available to users whether they are or not close to the bank. They add that technology has become a key element in the quality of services offered to customers. In contrast, 14% of managers find that technology is a load. According to them, although it is a strategic and essential tool for the proper functioning of the bank, technology is not an end in itself. It is only a tool. And in order to take full profit of it, accompanying actions must be undertaken: human resources must be upgraded; a revision and a redesign of the production processes are also essential in order to take into consideration the contribution of technology. Otherwise, it becomes an obstacle to the development of the bank.

#### 4.2 Survey Result Developed s within the Banking Services Using Technology Tools

##### 4.2.1 Impact of Technology on the Production Function

Emerging technologies are not limited to commercial businesses and banking distribution. They cause significant impact on the internal modes of functioning. Similarly to any firm, the bank attaches much of importance on capitalization and on the enrichment of its staff's competence.

Based on the question: "What is the effect of the introduction of new technologies on your internal way of working?" the questionnaire classifies the following different choices in five levels categorized from 1 to 5:

Table 5. Impact of technology on the production function

	Levels from 1 to 5					Total	Classification
	1	2	3	4	5		
Speed and reliability in transactions processing transactions processing	55%	27%	18%	-	-	100.00	1
Development of efficiency and accuracy	18%	55%	9%	18%	-	100.00	2
Reduction of the physical constraint behind the desk	-	18%	18%	27%	36%	100.00	5
Reduction of the error risk	-	9%	46%	18%	27%	100.00	3
Deletion of duplicate tasks	-	18%	27%	36%	18%	100.00	4

Following the results of this table, the speed and the reliability of operations processing are at the forefront of introducing new technologies on the production function (55%), followed by the development of efficiency and accuracy (55%). In fact, according to the bank managers, physical management of records was a real handicap for banks before automation, specifically for the quick processing and for the competitiveness of networks. Moreover, back-office treatments and front-office customer access require some speediness. Today, with new technologies and with the use of extremely reliable, efficient and more powerful tools, the speed and reliability of operations processing have known greater improvements. The reduction of the risk of errors is classified third (46%), followed by the deletion of duplicate tasks (36%). Finally, 36% of managers find that client-server systems managing databases allow much easier secured access to all users, reducing the constraints of physical presence behind a desk for employees. In addition, almost all surveyed managers added that new technologies facilitate storage and backup of historical data specifically for clients.

##### 4.2.2 Impact of Technology on the Distribution Function

According to Gerorski (2000), "what distinguishes a bank from another is the quality and efficiency that is able

to endorse through its supply system and thus by determining an extra added value to the customers”.

Based on this question: “what is the effect of the introduction of new technologies on your customer relationship?” the questionnaire classifies the following different choices in five orders of importance ranged from 1 to 5:

Table 6. Impact of technology on the distribution function

	Levels from 1 to 5					Total	Classification
	1	2	3	4	5		
Customer satisfaction	55%	27%	18%	-	-	100.00	1
Customer loyalty	9%	36%	27%	18%	9%	100.00	2
Enhancement of the quality of service	-	18%	46%	27%	9%	100.00	3
Loss of space constraints	-	-	18%	27%	55%	100.00	5
Loss of time constraints	-	9%	27%	55%	9%	100.00	4

Following the results of this table, 55% of managers believe that customer satisfaction ranks first for the introduction of new technologies concerning the relation with customers, followed by customer loyalty. According to Gerorski (2000), “in order to meet effectively the expectations of their clients and achieve loyalty objectives, banks will have to transform their distribution systems both in selling products and delivering services associated with these products”. Enhancement of the quality of service is ranked third with a 46% result. Indeed, managers found that their customers are served with the best possible quality.

Lastly, the introduction of new technologies leads at a 4th level to the disappearance of time constraints and at a 5th level to the disappearance of space constraint. In fact, clients have become increasingly demanding considering the appearance of NICT. It enables them to gain considerable time and reduce transaction costs. Thus, banks must renew permanently their range. They must also struggle against formalism and lateness and ensure they are faster than competitors both in the development of their products and in their distribution.

#### 4.2.3 Impact of Technology on the Productivity Function

Searching for productivity has been for a long time the major strategic goal for banks. According to the survey results, 82% of managers believe that the introduction of NICT causes a “very important” improvement of productivity and 18% of surveyed managers find that technology as a working tool leads to “important” development of productivity. Unfortunately, indicators studying the impact of these technologies on productivity are not available. Marrakchi (2000) pointed out in this context to the fact that “... we have no figures in terms of percentage about the effect of technology on productivity...” and Toufaily (2004) have not seen from her part any numbers on this matter.

On the other hand, we have tried to analyze the two essential criteria of the bank network’s productivity according to the use or not of new technologies:

The average number of operations performed by day;

The average time spent on each type of operation.

Table 7. Impact of technology on the productivity function

	Without the use of NICT		With the use of NICT	
	<i>Number of operations</i>	%	<i>Number of operations</i>	%
The average number of operations performed by day	Between 1 and 10	36	Between 1 and 20	18
	Between 11 and 50	55	Between 21 and 80	36
	More than 50	9	More than 80	46
The average time spent on each type of operation	<i>Time spent</i>	%	<i>Time spent</i>	%
	Between 1 and 30 min	54	Between 1 and 5 min	73
	Between 30 and 60 min	36	Between 15 and 30 min	18
	More than 60 min	9	More than 30 min	9

According to the above table, it appears that the overall productivity of the surveyed banks has improved: it was doubled. The effects of automation, including those processed by the network (operations withdrawal, payments,

transfers, and exchanges processed using e-banking systems and virtual ones), are positive: with NICT, the average number of operations performed by banks adopting new technologies is multiplied by two and the time devoted to each type of operation is divided by two. This shows that the effect of automation are favorable for the network's productivity because, firstly it relieves the system of a large number of operations treated earlier, and second it increases the "commercial time" available through the use of 'earned time' for commercial development operations.

However, it turned out that these productivity gains could have been much greater if the number of technical problems and failures could be reduced as IT managers reported. Indeed, 3% of the surveyed banks are facing problems of breakdown of their technology processing machines two times per month; 46% of them are facing that once a month and 18% of banks did not report anything. Concerning their reactions to such problems, 36% expect to adjust rapidly the failure; 55% expect to conclude operations at the agency either on their computers either manually, and 9% of them do nothing. This will reduce their productivity and hence minimize the performance of their network.

## 5. Conclusion

We tried through this paper to assess the impact of NICT on the banking business. Our investigations led to the observation that NICTs are playing an increasing role in the evolution of banking businesses. They are no longer limited to support change, they become the engine. NICTs are changing the basis of competition among electronic banks, virtual banks and non-bank actors, but also modifying the banking businesses.

Two conducted surveys through this paper led to convincing results: in the first one, the objective was to determine the NICT opportunity and the importance of investing in new technologies. The objective of the second survey was threefold: to define the impact of new technology on the production function of the Lebanese commercial banks, on their distribution function and on the banks' productivity function.

Hence, the first questionnaire results show that: i) the desire to develop their sphere of action, for the majority of Lebanese banks, appears to be the first strategic goal of introducing new technologies. In fact, it appears that it is a way for banks to outweigh their competitors; ii) improving productivity is the first benefit resulting from the introduction of new technologies; iii) the annual rate of growth of spending on information technology is increasing; iv) while technology is a strategic means and an essential tool for the well-functioning of the bank, it is not an end in itself. Furthermore and since the aim of the second investigation was to determine the impact of new technologies on the production function, on the distribution function and on the productivity of the bank, the results show that: i) the rapidity and reliability of processing operations are allowed by the introduction of new technologies on the production function; ii) the major effect of the introduction of new technology on the distribution function is the customer satisfaction; iii) overall productivity of the banks is multiplied by two. But this productivity could be better if the number of technical IT problems that occurs in the bank when processing operations or services could be reduced.

Finally, two fundamental questions arise from this research: what could be the future of the banking industry in Lebanon with the predominant invasion of e-banking models? And taking into account the efficiency of this sector, would it be easy to move to virtual banking models? We cannot answer within the framework of this paper these questions, but it is evident that with NICT, banks will always develop and no one today could describe with certainty the shape of the possible changes.

## Acknowledgements

We would like to express our thankful wishes to the Business Systems Laboratory Symposium 2015 for making the presentation of this paper possible. We would like also to express our deep gratitude to professors Gandolfo Dominici and Enzo Scannella for their guidance and useful critiques of this research work. We would also like to extend our appreciation and grateful thanks to all managers of commercial banks in Lebanon and employees in each department who supported and offered resources throughout this study.

## References

- Azzam, E. (2001). *L'impact des nouvelles technologies d'information et de communication (N.T.I.C.) sur le marketing bancaire*. Faculté de Gestion et de Management, Université Saint-Joseph, Liban. Retrieved from <http://www.fgm.usj.edu.lb/files/a162011.pdf>
- Banque du Liban. (2013). *Financial Markets Handbook*. Financial Markets Department: Beirut, Lebanon. Retrieved from [http://www.bdl.gov.lb/files/tabs/SectionI2013\[1\].pdf](http://www.bdl.gov.lb/files/tabs/SectionI2013[1].pdf)
- Berger, A., & DeYoung, R. (2002). Technological Progress and the Geographic Expansion of the Banking

- Industry. *Federal Reserve Board Finance and Economics Discussion Series 2002-31*. <http://dx.doi.org/10.2139/ssrn.318703>
- Bettaieb, K. (2001). L'e-banking, banque de future? *Finances et Développement au Maghreb*, (26), 6-13.
- Casolaro, L., & Gobbi, G. (2007). Information Technology and Productivity Changes in the Banking Industry. *Economic Notes*, 36(1), 43-76. <http://dx.doi.org/10.1111/j.1468-0300.2007.00178.x>
- Claessens, S., Glaessner, T., & Klingebiel, D. (2002). Electronic Finance: Reshaping the Financial Landscape around the World. *Journal of Financial Services Research*, 22, 29-61. <http://dx.doi.org/10.1023/A:1016023528211>
- Corvoisier, S., & Gropp, R. (2002). *Contestability, Technology and Banking*. European Central Bank working paper. EFA. <http://dx.doi.org/10.2139/ssrn.299404>
- De Coussergues, S. (2002). *Gestion de la banque* (3rd ed.). Paris, P: Dunod.
- Frame, W. S., & White, L. J. (2009). *Technological Change, Financial Innovation and Diffusion in Banking*. Federal Reserve Bank of Atlanta, Working Paper series 2009-10. <http://dx.doi.org/10.2139/ssrn.1434486>
- Gérard, L. (2001). *L'impact des NTIC sur les métiers et les compétences du secteur bancaire et financier*. Groupe de Prospective Vision Paris- Caen.
- Geroski, P. A. (2000). Models of Technology Diffusion. *Research Policy*, 29, 603-625. [http://dx.doi.org/10.1016/S0048-7333\(99\)00092-X](http://dx.doi.org/10.1016/S0048-7333(99)00092-X)
- Hancock, D. (1991). *A Theory of Production for the Financial Firm*. Boston: Kluwer Academy Publisher. <http://dx.doi.org/10.1007/978-94-011-3870-3>
- Heshmati, A. (2003). Productivity Growth, Efficiency, and Outsourcing in Manufacturing and Service Industries. *Journal of Economic Surveys*, 17, 79-112. <http://dx.doi.org/10.1111/1467-6419.00189>
- Hunter, W. C., & Stephen, G. T. (1986). Technical Change, Organizational form, and the Structure of Bank Productivity. *Journal of Money, Credit and Banking*, 18(2), 152-166. <http://dx.doi.org/10.2307/1992199>
- Karen, F., Lang, W., & Nolle, D. (2002). Internet Banking. *Journal of Financial Services Research*, (22), 95-117.
- Kortas, M. (1999). Opportunités de l'introduction de l'Internet-banking en Tunisie. *Finances et Développement au Maghreb*, 22, 51-56.
- Liikanen, E. (2002). *High-level Expert Group on reforming the structure of the EU banking sector*. Final Report, Brussels.
- Llewellyn, D. T. (2008). The Failure of Northern Rock: A Crisis Waiting to Happen. *Journal of Financial Regulation and Compliance*. <http://dx.doi.org/10.1108/13581980810853208>
- Llewellyn, D. T. (2009). UK Building Societies and the Financial Crisis: The Survival of Mutuality. In J. Mooij (Ed.), *Cooperative Banks in the Crisis*. Rabobank, Utrecht.
- Llewellyn, D. T. (2010). The Global Banking Crisis and the Post-Crisis Banking and Regulatory Scenario. *Topics in Corporate Finance*. Amsterdam Centre for Corporate Finance, University of Amsterdam, October.
- Llewellyn, D. T. (2011). *A Post-Crisis Regulatory Strategy: The Road to "Basel N" or "Pillar 4"?* Austrian National Bank Conference Proceedings, Annual Economics Conference, 2011, Austrian National Bank, Vienna.
- Mizrahi, S. (2000). Approche multi-canaux: Réinventer la banque. *Banque Magazine*, 611, 38-41. Retrieved from <http://www.arraydev.com/commerce/JIBC/2006-04/Ayadi.asp>
- OECD. (2004). *The Economic Impact of ICT-Measurement, Evidence and Implications*. OECD, Paris.
- Roux, C. (2013). Supervision and financial regulation at the Central Bank of Ireland. *Bank of International Settlements*. Retrieved from <http://www.bis.org/review/r131205d.pdf>
- Sahut, J. M. (2013). Business Model and Performance of Firms. *International Business Research*, 6(2).
- Saidane, D. (2001). La banque traditionnelle est- elle en déclin ? *Finances et Développement au Maghreb*, 27, 12-33.
- Solow, R. M. (1957). Technical Change and the Aggregate Production Function. *Review of Economics and Statistics*, 39, 313-330. <http://dx.doi.org/10.2307/1926047>
- Sullivan, R. (2001). Performance and Operation of Commercial Bank Web Sites. *Federal Reserve Bank of*

*Kansas City, Financial Industry Perspectives, 23-33.*

Toufaily, E. (2004). *Adoption de la banque électronique et son impact sur la performance organisationnelle: Cas du secteur du marché du Liban.* (Doctoral Dissertation). Université du Québec à Montréal, Canada. Retrieved from [http://www.irec.net/upload/File/memoires\\_et\\_theses/428.pdf](http://www.irec.net/upload/File/memoires_et_theses/428.pdf)

Webster, A. (1997). The Impact of Technological Change on Bank Performance. *Journal of Economics and Finance, 21*(3), 41-47. <http://dx.doi.org/10.1007/BF02929037>

## Notes

Note 1. Small Business Credit Scoring (SBSC) is one of the examples of information exchange tools which are a summary statistics personal data about the expected performance of a firm that would receive a future loan.

Note 2. This term covers both financial and insurance products as well as services.

Note 3. De Coussergues, S. (2002). *Gestion de la banque* (3rd ed.). Dunod, Paris.

Note 4. A banking structural reform reported by the High-Level Expert Group of the European Commission. The report proposed many reform options to the banking structure aiming at financial stability. [http://ec.europa.eu/finance/bank/structural-reform/index\\_en.htm](http://ec.europa.eu/finance/bank/structural-reform/index_en.htm)

Note 5. Exhaustive list of official operating national and international banks in Lebanon is available through <http://www.abl.org.lb/AllClassification.aspx?pageid=129h>

Note 6. ALMANAK of banks in Lebanon, Association of Banks in Lebanon, ABL Periodicals, 2014.

Note 7. The data collection had to be administrated personally with managers because of the limitations behind sending the questionnaires via intranet or electronic mails: Lebanese banks have to abide by the Law of Banking Secrecy. Hence, getting information thoroughly and carefully is recommended.

Note 8. Société générale des Banques du Liban is a Lebanese commercial bank.

Note 9. The number of outstanding credit cards by residents rose by 9.08% to 496,550 cards in the first half of 2014, their fastest pace since 2008. Banks also had 24,322 more outstanding debit cards with residents in the first half of the year, compared with only 14,519 more debit cards over the same period in 2013. Customers normally receive a debit card when opening a new bank account, and might also receive a credit cards part of a retail loan. The latest growth in payment cards, however, came from pre-paid cards which more than tripled to 472,515 cards in the 12 months through June 2014, likely as a result of their increased use by international donor agencies in Syrian refugees' relief efforts.

Note 10. Association of Lebanese Banks (ABL).

## Appendix A

### List of Official Commercial Lebanese Banks

Table A. List of official commercial Lebanese banks

1.	FRANSABANK S.A.L.
2.	BANQUE LIBANO-FRANCAISE S.A.L.
3.	B.L.C. BANK S.A.L.
4.	NEAR EAST COMMERCIAL BANK S.A.L.
5.	BLOM BANK S.A.L.
6.	FEDERAL BANK OF LEBANON S.A.L.
7.	SOCIETE GENERALE DE BANQUE AU LIBAN S.A.L. (SGBL)
8.	BANKMED S.A.L.
9.	AUDI PRIVATE BANK S.A.L.
10.	BBAC S.A.L.
11.	BANQUE PHARAON ET CHIHA S.A.L.
12.	BANQUE DE CREDIT NATIONAL S.A.L.
13.	BYBLOS BANK S.A.L.
14.	BANQUE DE L'INDUSTRIE ET DU TRAVAIL S.A.L. (BIT BANK)

---

15.	IBL BANK SAL
16.	BANK AUDI S.A.L.
17.	FENICIA BANK S.A.L.
18.	LEBANESE SWISS BANK S.A.L.
19.	BSL BANK S.A.L.
20.	BANK OF BEIRUT S.A.L.
21.	JAMMAL TRUST BANK S.A.L.
22.	BANQUE BEMO S.A.L.
23.	LEBANON AND GULF BANK S.A.L.
24.	SAUDI LEBANESE BANK S.A.L.
25.	AL-MAWARID BANK S.A.L.
26.	CREDITBANK S.A.L.
27.	UNITED CREDIT BANK S.A.L.
28.	BANK AL-MADINA S.A.L.
29.	FIRST NATIONAL BANK S.A.L.
30.	MEAB S.A.L.
31.	BLOM DEVELOPMENT BANK S.A.L.

---

*Note.* Association of Banks in Lebanon, categories of banks, commercial banks, retrieved from: <http://www.abl.org.lb/Banksclassification.aspx?pageID=129&type=Commercial>

### **Copyrights**

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/3.0/>).