

“Technological innovation in banking services: an exploratory analysis to perceptions of the front office employee”

AUTHORS	Joana R.G. Reis Fernando A. F. Ferreira José M. Monteiro Barata
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Joana R.G. Reis (Portugal), Fernando A.F. Ferreira (Portugal), José M. Monteiro Barata (Portugal)

Technological innovation in banking services: an exploratory analysis to perceptions of the front office employee

Abstract

It is widely recognized that the increased intensity of competition in the banking sector has had direct implications for financial institutions' approach to customers and how they define their business strategy. Considering that the current economic stance embraces innovation and technology as fundamental elements of strategic management and business and economic development, new approaches to the relationship between technological innovation and financial services are essential in achieving competitive advantage. Based on this premise, the purpose of this paper is to analyze the main effects of technological innovation on financial services at the bank branch level by evaluating responses from front office employees. The results show that information and communication technologies are an important lever in the modernization of the sector. Practical implications, strengths and limitations of our empirical study are also presented.

Keywords: bank branch, evolutionary trends, financial and banking services, technological innovation.

JEL Classification: M10, O16, O32.

Introduction

Few would contest that the current economic crisis triggered intensified worldwide competition in the financial and banking sector. This increased intensity of competition, boosted by the mechanisms of globalization, has had direct implications for the way banks define business strategies and approach their customers to achieve competitive advantage. Banking institutions in Portugal are no exception.

Regardless of the possible causes and potential solutions for the current economic crisis (for detailed discussion, see Beltratti and Stulz, 2011; Kowalski and Shchmurove, 2011; Puri et al., 2011; Spahr and Ferreira, 2011; Yeager, 2011; Wu, 2012; Xiao-yan et al., 2012), there is a general consensus that technological innovation and financial services are essential in achieving competitive advantage. In fact, it seems clear that technological innovation not only allows for lower costs, but also opens up a set of new opportunities that allow businesses to perform better in differentiated ways (*cf.* Ferreira and Cravo, 2004; Adekola et al., 2008; Melnikas, 2010; Pinto and Ferreira, 2010; Kim et al., 2011; Sawng et al., 2011). From this premise, an analysis devoted to the main effects of technological innovation on financial services at the bank branch level seems to be of great relevance. In particular, considering that *“bank branches are the primary place in which consumers have access to products for either building assets and/or obtaining credit”* (Serna, 2005, p. 2), it seems important to understand, among other things, what demands are placed on bank branch employees and what changes are promoted in the banking activity. Simultaneously, it also seems important to determine whether current and future bank customers are

prepared for further diffusion/evolution of information and communication technologies (ICTs) in the sector.

Methodologically, our study extends previous work of Pinto and Ferreira (2010) and Ramos et al. (2011), and reports the results obtained by direct inquiry (*i.e.* questionnaire surveys) from bank branch front office employees who operate in the region of Santarém, Portugal. We are unaware of any prior evidence reporting results of direct inquiry on bank branch employees in analyzing the impact of technological dissemination on financial services.

The remainder of the paper is structured as follows. Section 1 highlights the relationship between electronic distribution channels and retail banking and presents the most recent trends in the Portuguese banking system. Section 2 presents the methodological background and describes the process we followed to analyze the relationship between technological progress and financial services at the bank branch level. Results are also presented and analyzed. The final section concludes the paper with discussion and suggestions for future research.

1. Electronic distribution channels and retail banking

In recent years, financial institutions have undergone significant changes, many of them directly related to the progress driven by ICT. In Portugal, the banking sector has been one of the major investors in technological innovation and is recognized for having one of the most advanced European payment systems (Costa, 2006; Pinto and Ferreira, 2010). Beyond the interest associated with gaining competitive advantage, this investment is also linked to the technological evolution of society itself, which motivates an intense demand for increasingly sophisticated products and services (Ferreira, 2003). From this

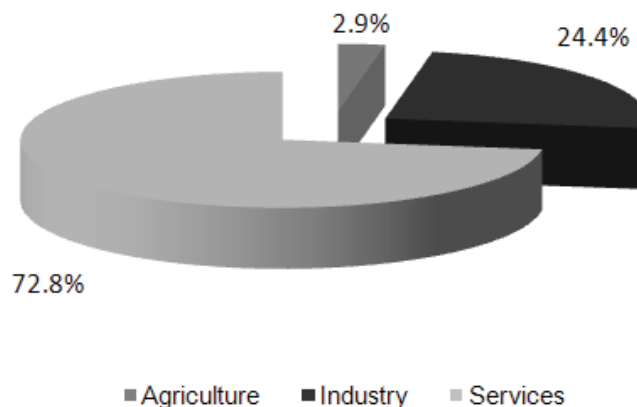
perspective, distribution channels have also evolved. Currently, retail banks in Portugal provide alternative distribution channels based on the Internet and/or new technologies, including the *automated teller machine* (ATM), *point of sale* (POS), *MB Phone*, *MB Net*, and *MB Spot*, to name just a few. According to Carvalho and Encantado (2006), the most obvious impact of these developments is that customers can take advantage of banking services more quickly and efficiently than in the past. In the following subsections, further details are presented in terms of technological innovation for banking purposes in Portugal.

1.1. Payment system in Portugal. Payment systems are seen as links (i.e. it is through these links that payments are made) and, as such, include not only customers and institutions but also means of payment (e.g. checks, bank transfers). This variety of “variables” justifies the constant demand for technological developments and, therefore, “*the Banco de Portugal [Portuguese Central Bank, after translation] has encouraged and closely monitored the automation of payment systems*” (Banco de Portugal, 2009).

This development has led financial institutions to an increased use of payment instruments.

The automation of payments is also responsible for the creation and interrelation of different payment systems. For example, the *Single Euro Payments Area* (SEPA) system ensures the low cost and high efficiency of bank transactions among eurozone countries. Another example can be found in the *Interbank Clearing System* (SICOI), which deals with retail payments and involves the collection of values that are related to the use of payment systems.

The number of people using electronic payment systems has increased significantly in recent years (cf. Ferreira, 2003; Pinto and Ferreira, 2010). Among other causes, this evolution can be attributed to technological innovation, which provides customers with a higher level of trust and efficiency. From this premise, the payment system is a service offered by banks and is regarded as a key factor for the balance of the economy. In the analysis of Portuguese gross domestic product (GDP) in 2009, the considerable weight of services in this indicator (which includes banking services) should be noted (Figure 1).



Source: Data extracted from *World Factbook* (CIA, 2010).

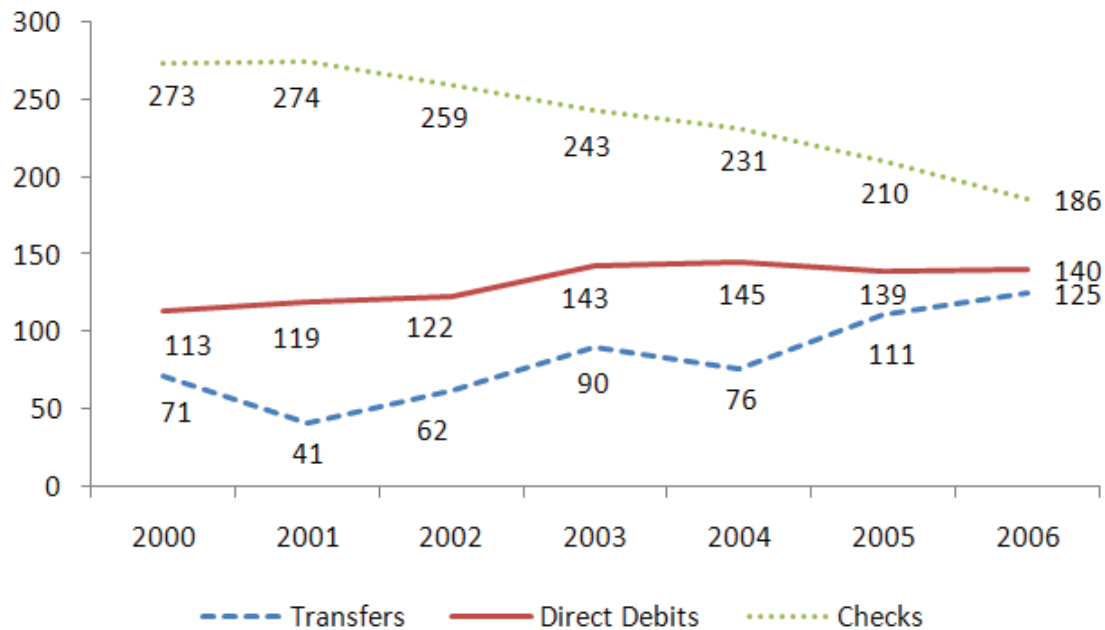
Fig. 1. Portuguese GDP by activity sector

Given the information in Figure 1, it should be noted that services are critical to the balance of the Portuguese economy, not only because of their higher share in the country’s GDP (72.8%) but also because they are considered one of the most dynamic sectors of the economy. In this sense, one may assume that the dynamism presented herein is based, in part, on constant technological advances, which naturally influence distribution channels. With the payment system included in this sector, its importance cannot be neglected because the automation of payments can contribute to a financial system that becomes more

efficient and creates added value for society in general.

1.2. National trends in the use of ICT in Portugal.

According to Banco de Portugal (2009), Portugal has one of the most advanced electronic payment systems in Europe. With the development of technology, automated payment became necessary to achieve maximum efficiency and security in transactions. Data provided by the European Central Bank (Fontes, 2008) allow us to formulate some conclusions about the evolution of the main means of payment (i.e. checks, electronic transfers, direct debits). Figure 2 illustrates these evolutionary trends.



Source: Dias Lopes (2008, adap.).

Fig. 2. Evolution of the main means of payment (millions of transactions/year)

An analysis of different types of payments allows us to assert that the increase in transactions is mainly due to strong growth in transfers. In contrast, there is a significant decrease in the use of checks, which could be justified by greater adherence to the new electronic distribution channels. For direct debits, we can observe a slight increase, although it is almost insignificant when compared with the total value.

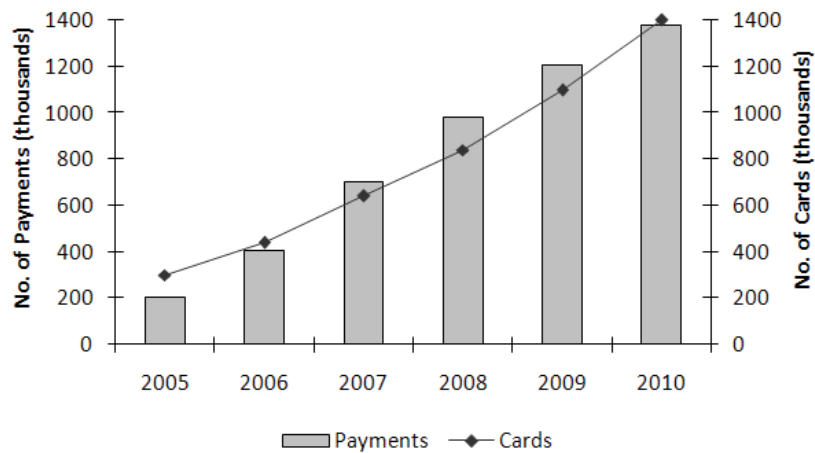
According to a study developed by Banco de Portugal (2007), despite its progress, the Portuguese payment system is considered deficient because it has annual costs of 1139 million euros and generates revenues of only 722 million euros (data from 2005). However, the recent evolution of the payment system in Portugal seems to provide support for the sustainable use of electronic payments. Therefore, in the next two subsections, we present a brief characterization of two of the most representative electronic distribution channels in Portugal: ATM and MB Net.

1.2.1. ATM. The ATM is an electronic device that appeared in Portugal for the first time in the 1980s as a trademark and property of *Sociedade Interbancária de Serviços* (SIBS) (Interbank Services Company, after translation). In 1985, with the appearance of credit cards, customers had access to ATMs. Initially, very few activities were offered by these operational devices and bank customers only had access to surveys and information about bank account movements and balances. Over the years, SIBS has increased the services offered by ATMs, which has resulted in a significant increase in the number of banking

operations and, consequently, an increased number of automated teller machines.

Over the years, the supply of available operations using a bank card has been extended. Customers started to have access to automated payment terminals (*i.e.* TPAs or, in English, points of sale). Indeed, customers can, with a simple card, make payments, meaning that they no longer have the worry of carrying large sums of cash. In addition, companies' bank accounts are greatly facilitated because the technology factor helps them avoid mistakes and losses. For these reasons, the service enjoys large acceptance among the population. Currently, in accordance with SIBS (2011), the ATM network is an integrated network of ATMs and POSs, with more than 13.000 ATMs and more than 200.000 POS terminals.

1.2.2. MB Net. Internet access in recent years has increasingly been facilitated by developments in technology, allowing better and faster access and more affordable prices. Thus, many financial institutions have seen the Internet as a market to explore and have begun to offer products and services through this distribution channel. With the rise of electronic commerce, and with the insecurity felt by consumers in making payments online, SIBS, together with *Cartão de Crédito Internacional, S.A.* (Unicre), launched a new service: the MB Net. Figure 3 illustrates the evolution of the MB Net in Portugal. It should be clarified, however, that the increasing use of this service has not been as great as Internet access, due to the insecurity of Internet users in terms of confidentiality of personal data.



Source: SIBS (2013).

Fig. 3. Evolution of MB Net

MB Net is a free service that allows customers to make purchases through the Internet, phone, and e-mail. It also allows Internet users to make online transactions with a temporary virtual card. From this perspective, it seems easy to assert that the banking sector in Portugal has made good use of the opportunities brought by technological innovation, specifically at the payment system level. In fact, given the automation of operations, banks have realized that the more money they invest in technology, the faster and more efficient their services are (for further details, see Ferguson et al., 2004; Ferreira, 2005; Nord et al., 2007; Dias Lopes, 2008; Fontes, 2008; Ramos et al., 2011).

The Banco de Portugal, with the indispensable help of SIBS, revolutionized the payment system in Portugal. However, has this transformation been absolutely positive? In fact, presently, the banking sector can no longer survive without technology because its absence would slow services and be completely outside the current context of processing services and customer care. Therefore, it seems important to note that clients' daily lives have improved considerably due to the automation of services, which allows clients to carry out all operations and save time. Based on the discussion presented herein, an analysis made in terms of technological impact on financial services from the perspective of front office employees seems to be of extreme relevance. In particular, considering that banks require qualified people in terms of technological skills, we can say that front office employees face additional pressure because they deal with both bank managers and bank customers. We should also bear in mind that technological innovation and payment automation have resulted in less frequent use of physical bank branches, which in turn has led to a reduction in the average number of employees per bank branch (Table 1).

Table 1. Evolution of the number of employees per bank branch

	2008*	2009	2010	2011
Average No. of employees per branch	10	9	7	7

Source: APB (2013, *adap.*).

Note: *June.

The latest trends allow us to assert that there has been a reduction in the number of employees per bank branch, and this trend has been gradually decreasing given the growing range of products and services based on ICT (*cf.* Ferreira, 2003; Pinto and Ferreira, 2011). Given the above, it may be said that payment automation has brought greater convenience to customers but, on the other hand, has also brought concerns to the front office staff. It is precisely based on those concerns that an empirical study was developed. In the next section, the methodological background and the process we followed to analyze the relationship between technological progress and financial services at the bank branch level are presented.

2. Empirical study at the bank branch level

As mentioned before, the main motivation for this paper was to investigate the major effects of technological innovation on financial services, and the methodology used focused on questionnaire surveys directed to bank branch front office employees who operate in the region of Santarém, Portugal (see Appendix). At this stage, it seems opportune to clarify that the responses resulted from a convenience or accidental sample, which involved a total of fifty questionnaires. Regardless of the low number of questionnaires and the reason of convenience, it should be noted that due to the demographic characteristics of the region of Santarém, fifty respondents represent a considerable portion of the number of front office

employees operating in the region. Also, we did not investigate possible correlations between variables. While this may be seen as a limitation, it seems important to emphasize that this position, together with the fact that our study was an exploratory analysis (cf. Yin, 1994), allowed us to collect, confront, and manage different opinions from different front office employees of different banks.

Following the guidelines proposed by Hill and Hill (2005), our questionnaire was tested before being administered to the respondents, and it is settled in four blocks. The first block was composed of questions related to the characterization of the current situation in terms of technological innovation for financial service purposes. The second block was composed of questions related to the use of new technologies and their influence on bank branch front office employees. The third block allowed for forecasting of evolutionary trends. Finally, the fourth block was composed of questions related to the characterization of the inquired sample of respondents. In the following sections, we will present the results obtained with the first three groups of questions. As for the fourth group (i.e. sample characterization), the average respondent was between 41 and 50 years old and had secondary education in business administration. In terms of gender, 50% of the respondents were women.

2.1. Characterization of the current situation. The first question of the first group (see Appendix) aimed to obtain answers characterizing the importance that each front office employee assigned to each electronic distribution channel. From Table 2, we can conclude that the preferred distribution channel of respondents is

the ATM, with 38 respondents selecting “*utmost importance*” (i.e. “5” on a *Likert* scale ranging from 1 to 5). The fact that respondents assigned utmost importance to the ATM is justified by the increased growth rate of this distribution channel. With an increasing number of automated operations, the number of customers visiting bank branches has fallen, creating a significant impact on bank employees’ professional routines.

As can be seen in Table 2, the average importance assigned to the ATM and the Internet is 4.74 and 4.54, with a standard deviation of 0.487 and 0.646, respectively. The fact that both have an approximately average importance derives from the rapid growth of Internet use for banking purposes. Indeed, the Internet is the communication channel with the largest growth in customer use and, in banking, the use of MB Net reinforces this conclusion. The number of customers using MB Net has grown exponentially and the outlook is for further increases. Therefore, it seems natural for bank employees to consider the Internet a channel with high importance in their daily activity because, like the ATM, it significantly reduces the number of customers who visit bank branches and facilitates the work flow. On the other hand, devices that have less importance for the respondents (i.e. “*minor importance*”) are mobile devices (4 responses), telephone (4 responses), and extranet (3 responses). It is also important to note that two of the respondents, under the heading “*other*”, said that the quick deposit machine was of “*utmost importance*”. In general, ATMs and the Internet were considered more important in employees’ daily activity.

Table 2. Importance assigned to each channel

	1		2		3		4		5		Average	Mode	St. deviation
	N	%	N	%	N	%	N	%	N	%			
ATM	0	0	0	0	1	2	11	22	38	76	4.74	5	0.487
Extranet	0	0	3	6	9	18	18	36	17	34	3.80	4	0.911
Internet	0	0	0	0	4	8	15	30	31	62	4.54	5	0.646
Mobile device	0	0	4	8	12	24	17	34	16	32	3.84	4	0.947
Telephone	0	0	4	8	12	24	19	38	15	30	3.90	4	0.931
Other	0	0	0	0	0	0	0	0	2	4	0.20	5	0.970

The second question of the first group related to the electronic distribution channels with greatest growth in use. Most responses fell on the Internet, followed by ATMs, which shows a logical continuation of the importance level attributed to these two electronic distribution channels in the activity of the respondents (Table 3).

Table 3. Electronic distribution channels’ growth

	N
ATM	10

Extranet	3
Internet	31
Mobile device	4
Telephone	0
Other	0
N/Response	0
Invalid response	2
Total	50

Based on Table 3, it should be noted that, among all displayed channels, the telephone was the only one that, according to respondents, has not experienced

growth in use in the last years. Moreover, the channel with the highest usage rate was the Internet, followed by the ATM. These two distribution channels were also considered the ones more dependent on the use of new technologies. As shown in Table 4, some aspects of daily operations at bank branches have changed profoundly.

Table 4. Operations with higher dependence of new technologies

	N
Activation, query extract, and card operations	27
Balance queries, movements, and NIB	27
Check requests and cancellations	9
Movements export to excel	5
National and foreign transfers	27
Payments to state (e.g. income tax, VAT, stamp duty)	20
Service payments	27
Transfer warnings and payments scheduled by e-mail and SMS	14
Other	0
N/response	0
Invalid response	44
Total	200

Following Table 4¹, we can observe that, in the context of daily activities, the operations that are more dependent on the use of new technologies are *activation, query extract and card operations; balance queries, movements and NIB; service payments; and national and foreign transfers*, with 27 responses each. As previously discussed, the lower rate given to *check requests and cancellations* is mainly due to the reduced use of checks as a form of payment.

2.2. New technologies and their influence on front office employees. In the second group of the questionnaire (see Appendix), we aimed to understand the impact that the introduction of ICT has brought to front office employees and where they feel the most impact in their professional activity. Overall, as shown in Table 5, the responses were uniform, demonstrating that the introduction of ICT has affected almost all areas of the respondents' work.

Table 5. Areas in which respondents feel more affected

	N
Accounting	7
Applications	36
Credit	23
International operations	19

¹ In this question, there were a total of 200 responses because each respondent was asked to indicate four of nine options available. However, in some surveys, the four answers were not verified. In these situations, as the designation indicates, the item "Invalid response" represents the number of invalid responses. In this case, 11 of the questionnaires did not have the 4 answers and 44 were identified as invalid responses.

Processing and data management	32
Services	22
Treasury	14
Other	3
N/Response	4
Invalid response	40
Total	200

Regarding the areas where respondents feel more affected by the introduction of ICT, it should be noted that great importance is given to *applications*, with 36 responses. Soon afterward comes *processing and data management*, with 32 responses. In recent years, all businesses have undergone profound changes so as to ensure better services and products than competitors. Thus, it seems natural that respondents chose *applications* and *processing and data management* as two of the most dependent variables of new technologies, contributing to faster and more efficient services. In contrast, respondents chose *accounting* as the least affected area by ICT, followed by *treasury, credit, and services*. These respondent choices arose because ICT did not lead major functional changes in these areas.

The next issue of this group was based on the main advantages brought by the introduction of ICT to banking processes. Considering the respondents' answers, the biggest advantage is *speed* (Table 6).

Table 6. Main advantages of the introduction of ICT

	N
Efficiency	11
Less errors	5
Motivation	0
Quality	5
Speed	23
N/Response	1
Invalid response	5
Total	50

According to the respondents, the introduction of ICT in Portuguese banks did not bring any advantage in terms of motivation because it requires commitment and dedication to be up-to-date and able to carry out job duties competently. However, the respondents' average age of 40 years may explain the lack of motivation among employees. As shown in Table 6, the main advantages brought by the introduction of ICT for banking are *speed*, followed by *efficiency, less errors, and quality*.

Regarding the disadvantages brought by new technologies, respondents considered the *loss of human contact* to be the main disadvantage. Next came *work overload*, with 20% (Table 7).

Table 7. Main disadvantages of the introduction of ICT

	N	%	% accum.
Change of tasks to perform	2	4	4
Decreased autonomy	5	10	14
High-level requirement	3	6	20
Loss of human contact	20	40	76
Need for constant learning	8	16	36
Work overload	10	20	96
Other	0	0	96
N/Response	1	2	98
Invalid response	1	2	100
Total	50	100	

According to the respondents, *work overload* was directly related to the introduction of ICT. In fact, the introduction of ICT represents more extinct jobs and employees to be dismissed. Thus, employees who remain in the respective institutions are overloaded with duties due to reductions in the number of workers. Eight respondents also considered the *need for constant learning* to be the main disadvantage (16%), five reported *decreased autonomy* (10%), and three chose *high-level requirement* (6%).

Using the same process of inquiry, the next question aimed to understand the changes that occurred in the professional lives of bank employees with the introduction of ICT. Table 8 presents the answers given by respondents.

Table 8. Changed aspects of employees' daily activity

	N
Service adaptation	6
Versatility	22
Volume of services	18
Working hours	0
Other	0
N/Response	2
Invalid response	2
Total	50

The variable that bank employees believed to have a greater impact on their daily activity was *versatility*, with 22 responses. Again, this was due to the introduction of ICT and the extinction of some jobs, which required bank branch employees to be more versatile in meeting market demands. In practice, the introduction of ICT brought faster operations, which tends to maintain the work schedule. Furthermore, the introduction of ICT in banking institutions also strongly affected their organization. As seen throughout the analysis of the questionnaire, employees have been the target of changes in terms of both functions performed and demand for training and career levels.

The next question of this group aimed to understand the major impact to the respondents' careers that resulted from the introduction of new electronic distribution channels in the banking activity. As indicated in Table 9, 24 respondents chose *better qualification* as the more evident impact.

Table 9. Career impact on bank employees of the introduction of ICT

	N
Better qualifications	24
Career stagnation	5
Chance of career progression	4
Unemployment	12
Other	2
N/Response	1
Invalid response	2
Total	50

It seems important to emphasize that two potential opposite responses, *chance of career progression* and *career stagnation*, were given similar importance. One possible explanation involves the difference in age among the employees surveyed. More specifically, most respondents who selected *career stagnation* were individuals whose age was above the average, which seems to make it more difficult to cope with the demands of ICT. Therefore, they considered that ICT implies career stagnation. In contrast, the respondents who chose *chance of career progression* were below the average in age, which has a contrary effect. It should also be noted that 12 respondents thought that the main career impact was *unemployment*, supported by the fact that the introduction of ICT reduces the number of jobs. Also, two respondents chose *other*, mentioning that the main impact on career was *higher expectations*.

The last question of this group provided information about existing uncertainties in the respondents' work. The responses allowed us to consider that the major uncertainties are related to *work's physical environment*, *stability of the employment post*, and *labor structure* (Table 10).

Table 10. Insecurities in the activity of bank employees with the introduction of ICT

	N
Activity and work	20
Competencies and skills	14
Employment instability	8
Labor structure	21
Productivity	13
Promotion and career development	17
Stability of the employment post	21
Work's physical environment	21
Other: unspecified	1
N/Response	8

Table 10 (cont.). Insecurities in the activity of bank employees with the introduction of ICT

	N
Invalid response	56
Total	200

Regarding the *stability of the employment post*, the employees had reason to believe that this is one of the largest uncertainties because, as mentioned earlier, the average number of employees per branch has been reduced (*cf.* Ramos et al., 2011). Furthermore, *work's physical environment* also changed with the introduction of ICT.

2.3. Banking and innovation. The third group of the questionnaire aimed to understand the impact of technological innovation in terms of banking products and services. Accordingly, the first question sought to identify which ATM operations have more impact on the daily routines of human resources. Table 11 illustrates the responses provided in this context. It should be clarified that the results presented are composite results because respondents were asked to select four of the eleven options available.

Table 11. ATM transactions that have most relevance for human resources restructuring

	N
Account movements	15
Balance queries	10
Charging cell phones	4
Deliveries and deposits	27
Direct debits	19
Interbank transfers	23
Internal transfers	7
Money withdrawals	29
Query NIB, IBAN, etc.	5
Service payments	25
Other	0
N/Response	4
Invalid response	32
Total	200

With the development of ICT, ATMs offered more available operations and, thus, customers began to adhere to those operations, which led to changes in terms of human resources organization. Among the ATM operations available, the ones that respondents considered to have greater impact on the restructuring of human resources organization were *money withdrawals*, *deliveries and deposits*, and *service payments*.

The next question related to banking operations that have decreased since the introduction of the MB Phone, which allows customers to perform banking operations using their mobile phones. Table 12 illustrates the responses obtained.

Table 12. Decrease in branch operations since the appearance of the MB Phone

	N	%	% acum
Account movements	5	10	42
Balance queries	12	24	32
Charging cell phones	4	8	8
Checkbook requests	3	6	66
NIB query	0	0	32
Service payments	9	18	60
Transfers between accounts	6	12	78
Other	3	6	84
N/Response	0	0	84
Invalid response	8	16	100
Total	50	100	

According to respondents, the banking operations that have declined most since the introduction of the MB Phone are *balance query* and *service payments*, with 24% and 18%, respectively. It is also important to note that three of the respondents said that the appearance of the MB Phone had no impact on banking operations, materialized on the answer *other*. Following this question, we tried to identify the main advantage that MB Net service offers to customers. Table 13 presents the results.

Table 13. Advantages of the MB Net service

	N
Commodity	25
Efficacy	4
Security	9
Speed	9
Other	0
N/Response	0
Invalid response	3
Total	50

As can be noticed, 50% of the respondents indicated that the main advantage to customers was *commodity*. However, it should be emphasized that adherence to this service has not been as great as the growth of the Internet for banking purposes. As for *speed* and *security*, only nine of the respondents chose them as main advantages. The item that received the fewest responses was *efficacy*, with only 4 responses, i.e., only 8% of the respondents believed that front office efficacy is the main advantage of MB Net.

With the advent of MB Code, customers of most banks have started to conduct online transactions with offline passwords, which increases security. However, as a service related to the Internet, customers still have some fear of making transactions through this new distribution channel, and only one contributor pointed out that the level of customer confidence in this service is between 80% and 100% (Table 14).

Table 14. Customers' confidence level regarding MB Code

	N	%	% accum.
[0%-20%[	4	8	8
[20%-40%[	9	18	26
[40%-60%[	21	42	68
[60%-80%[	14	28	96
[80%-100%]	1	2	98
N/Response	1	2	100
Invalid response	0	0	100
Total	50	100	

A considerable number of customers had a confidence level for this service between 40% and 60%. Therefore, in general terms, respondents believed that customers have a relatively good level of confidence about this service, with 70% of respondents between 40% and 80%.

MB Spot is a service that allows customers to perform the most common operations in commercial establishments and, therefore, avoid visiting a bank branch. In this sense, the next question aimed to identify the main advantage of this service for banking activity. Table 15 presents the answers obtained.

Table 15. Advantages of MB Spot for banking

	N
Cost reduction	11
Customer satisfaction	7
Reduction of client influx to branches	16
Speed of services provided	10
Other	1
N/Response	1
Invalid response	4
Total	50

Based on Table 15, the main effects are associated with *reduction of client influx to branches* and, hence, the *speed of services provided*. On the other hand, 11 of the respondents believed the main advantage of this service is *cost reduction*.

The next question of this group aimed to understand the relationship between customers' adherence to ICT and their age. This question was based on a *Likert* scale ranging from 1 to 5 (1 = *no adherence* and 5 = *great adherence*) to ascertain the uptake of ICT by age (Table 16).

Table 16. ICT adherence by age group

	1		2		3		4		5		Average	Std. deviation
	N	%	N	%	N	%	N	%	N	%		
Less than 21	0	0	2	4	11	22	20	40	13	26	3.64	0.863
21-25 years	0	0	0	0	4	8	16	32	26	52	4.12	0.720
26-30 years	0	0	0	0	4	8	20	40	23	46	4.14	0.679
31-40 years	0	0	0	0	7	14	27	54	12	24	3.78	0.691
41-50 years	0	0	8	16	20	40	18	36	0	0	2.96	0.741
51-60 years	1	2	20	40	21	42	4	8	0	0	2.40	0.685
More than 60	12	22	22	2	6	7	2	0	1	2	1.74	0.886

Table 16 shows that most of the respondents believed that the age group that has greater ICT uptake is between 21 and 25 years because, in general, this is an age group particularly sensitive to technological developments. On the other hand, for the age groups of 41-50 and 51-60, respondents

mostly chose level 3 of adherence, which shows that the adherence to ICT decreases as customers' ages grow higher.

Using the same process of direct inquiry, the next question concerned the level of security associated with each electronic distribution channel (Table 17).

Table 17. Level of security associated with each electronic distribution channel

	1		2		3		4		5		Average	Std. deviation
	N	%	N	%	N	%	N	%	N	%		
ATM	0	0	0	0	1	2	30	60	19	38	4.36	0.525
Extranet	0	0	1	2	18	36	19	38	9	18	3.54	0.793
Internet	0	0	2	4	12	24	27	54	8	16	3.76	0.742
Mobile device	0	0	1	2	14	28	31	62	4	8	3.76	0.625
Telephone	0	0	1	2	12	24	33	66	3	6	3.70	0.586
Other	0	0	0	0	1	2	2	4	0	0	0.22	0.861

Taking into account the responses presented in Table 17, 60% of the respondents believed that the security of the ATM is at level 4, and 38% assigned it maximum security. The respondents' choice can be

attributed to the fact that the ATM was the first electronic distribution channel to emerge in Portugal and, as such, has undergone major changes over the years, including the level of security. In general terms,

almost all respondents assigned a security level between 3 and 4 to all electronic distribution channels, which shows that the this type of distribution is considered relatively safe.

As for the factors that facilitate innovation, the responses indicated that 39 respondents considered *global competitiveness* to be among the four factors that most facilitate innovation. It should be clarified that the results presented in Table 18 are composite results because respondents were asked to select four of the eight options available.

Table 18. Factors that facilitate innovation

	N
Connectivity	25
Customer relationship	24
e-Business	16
Focus on business	17
Global competitiveness	39
Integration of value chain	15
Search for business growth	36
Other	0
N/Response	0
Invalid response	28
Total	200

The last question of this group was related to factors that hinder further innovation in banking activity. According to the respondents, the most important factor hampering innovation is *innovation costs*, followed by *lack of customer receptivity* (Table 19).

Table 19. Factors that hinder innovation

	N
Innovation costs	32
Lack of appropriate sources of financing	4
Lack of customer receptivity to new products	25
Lack of information on markets	7
Lack of information on technology	23
Lack of qualified personnel	23
Organizational structure less flexible	21
Perception of excessive economic risks	13
Standards and regulations too rigid	18
Other	2
N/Response	0
Invalid response	32
Total	200

According to Table 19, respondents also thought that *lack of customer receptivity to new products*, *lack of information on technology*, and *lack of qualified personnel* were strategic constraints to the implementation of new technologies in the banking sector.

Following the results presented herein, it should be emphasized that respondents considered the ATM as

the electronic distribution channel with greatest importance in the banking context. However, this electronic distribution channel does not have a growth rate as high as MB Net. This is mainly due to the constant technological evolution and the appearance, increasingly pronounced, of Internet users. Moreover, MB Net is a convenient service because it does not require client visits to bank branches. Based on the analysis made in the daily activity of front office employees, the operations that are more dependent on the use of new technologies are *activation, query extract and card operations, balance queries, movements and NIB consultation, service payments, and national and foreign transfers*. With regard to areas where employees feel great impact because of ICT diffusion, respondents named a high *loss of human contact* because operations previously completed by people are now performed by electronic devices. Thus, employees feel great uncertainty about the *stability of the employment post* because the more technology exists, the fewer employees are needed. In this sense, human resources restructuring undergoes major changes with the introduction of ICT but, in the case of operations at ATM terminals, the main reason for this are money withdrawals. Considering the variety of new electronic distribution channels (e.g. MB Phone), customers have at their disposal the possibility of conducting banking operations via their mobile phones. In fact, according to the respondents, this remark supports the decrease of certain operations carried out at bank branches (e.g. *balance queries* and *service payments*). As such, one may assume that ICT is evolving and, in the banking context, bringing significant impact in terms of financial services.

Discussion and concluding remarks

Factors such as globalization and technological change have led to an increase of competitiveness among companies. This increased competitiveness is more pronounced when it is associated with the concepts of differentiation and competitive advantage. Indeed, companies have suffered from the changes introduced by these factors and, by analogy and/or consequence, the banking sector is no exception. In particular, this evolution has been felt through constant changes in the products and services offered by banking institutions (Carmoy, 1992). Therefore, a study focusing on the impact of technological innovation on banking industry and customer management seems to be of great relevance. In particular, our study seems important in clarifying that the new electronic distribution channels carry both advantages and disadvantages. For example, ICT allows for the development of banking initiatives (Ferreira, 2003, Ramos et al., 2011). On the other hand, there seems to be a general consensus that the introduction of new electronic distribution channels also brings negative

effects, such as loss of human contact and career stagnation (Ramos et al., 2011). Regarding customers, we can assume that the trend toward the use of new electronic distribution channels for banking purposes has been increasing gradually among younger clients.

The main corollary of this study is that bank employees feel increasing pressure to follow technological progress, which requires a mentality change in financial services. Bearing in mind the

methodological limitations previously referred to in this paper, specifically in terms of exploration and convenience, the results cannot be extrapolated. Thus, further investigation on this topic is strongly encouraged. Specifically, more case studies and the use of a more grounded sampling process are recommended to extrapolate and generalize our results. We are optimistic that further research and/or simple updates will strengthen the line of research presented in this study.

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Appendix. Questionnaire

<h3 style="margin: 0;">Questionnaire</h3> <p style="margin: 10px 0;"><i>Main Impacts of Technological Innovation on Financial Services</i></p> <p style="margin: 0;"><i>(According to Front Office Employees)</i></p>

Contact: Joana Reis

E-mail: joanar.gomes.reis@gmail.com

Note: This questionnaire has purely academic purposes, and all answers provided will be treated confidentially. The questionnaire ends with the words “End of the Questionnaire”.

Fill instructions: Read all the questions carefully and try not to leave answers blank. Pay special attention to the instructions given in each question.

Group I – Characterization of the current situation

1. As part of your banking activity, which importance do you attach to each electronic distribution channel? (Tick your answer for each item, considering a scale from 1 to 5 (1 = unimportant and 5 = utmost importance)).

1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ATM
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Extranet
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Internet
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mobile device (e.g. cell phone)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Telephone
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other

2. From the electronic distribution channels mentioned below, please indicate the one that had the biggest growth in usage over the last year? (Tick your answer, according to the fill instructions).

<input type="checkbox"/> ATM
<input type="checkbox"/> Extranet
<input type="checkbox"/> Internet
<input type="checkbox"/> Mobile device (e.g. cell phone)
<input type="checkbox"/> Telephone
<input type="checkbox"/> Other

3. As part of your daily activity, which of the following operations are more dependent on the use of new technologies? (Tick the four most dependent operations, according to the fill instructions).

<input type="checkbox"/> Activation, query extract, and card operations
<input type="checkbox"/> Balance queries, movements, and NIB
<input type="checkbox"/> Check requests and cancellations
<input type="checkbox"/> Movements export to excel
<input type="checkbox"/> National and foreign transfers
<input type="checkbox"/> Payments to state (e.g. Income tax, VAT, Stamp duty)
<input type="checkbox"/> Service payments
<input type="checkbox"/> Transfer warnings and payments scheduled by e-mail and SMS
<input type="checkbox"/> Other

Group II – New technologies and their influence on employees

1. Indicate the areas where you feel most affected by the introduction of ICT in your banking activity. (Tick the four most affected areas, according to the fill instructions).

- Accounting
- Applications
- Credit
- International operations
- Processing and data management
- Services
- Treasury
- Other

2. What do you consider the main advantage that the introduction of ICT has brought to your professional daily activity? (Tick your answer, according to the fill instructions).

- Efficiency
- Less errors
- Motivation
- Quality
- Speed

3. What do you consider the main disadvantage that the introduction of ICT has brought to your professional daily activity? (Tick your answer, according to the fill instructions).

- Change of tasks to perform
- Decreased autonomy
- High-level requirement
- Loss of human contact
- Need for constant learning
- Work overload
- Other

4. Considering your daily activity as a bank employee, in which way was this changed by the introduction of ICT in banking? (Tick your answer, according to the fill instructions).

- Service adaptation
- Versatility
- Volume of services
- Working hours
- Other

5. In terms of career, what is the most obvious impact of the widespread introduction of ICT? (Tick your answer, according to the fill instructions).

- Better qualification
- Career stagnation
- Chance of career progression
- Unemployment
- Other

6. With the introduction of ICT, many aspects have changed but, in banking, which aspects of your daily activity emerged as insecurities? (Tick the four most relevant insecurities, according to the fill instructions).

- Activity and work
- Competencies and skills
- Employment instability
- Labor structure
- Productivity
- Promotion and career development
- Stability of the employment post
- Work's physical environment
- Other

Group III – Banking and innovation

1. From the operations that can be conducted through the ATM terminal, please indicate which are considered of greatest relevance to the restructuring of human resources in banking. (Tick the four most relevant operations, according to the fill instructions).

- Account movements
- Balance queries
- Charging cell phones
- Deliveries and deposits
- Direct debits
- Interbank transfers
- Internal transfers
- Money withdrawals
- Query NIB, IBAN, etc.
- Service payments
- Other

2. Since the emergence of MB Phone, which operations have decreased over counter transactions? (Tick your answer, according to the fill instructions).

- Account movements
- Balance queries
- Charging cell phones
- Checkbook requests
- NIB queries
- Service payments
- Transfers between accounts
- Other

3. Taking into account the MB Net Service, please indicate the main advantage over previously available services. (Tick your answer, according to the fill instructions).

- Commodity
- Efficacy
- Security
- Speed
- Other

4. As the MB Code is a recent and innovative service resulting from ICT, how do you consider the customers' level of confidence in the same? (Tick your answer, according to the fill instructions).

- [0%-20 %]
- [20%-40%]
- [40%-60%]
- [60%-80%]
- [80%-100%]

5. The MB Spot brings many advantages for customers and merchants, as well as bank employees and banks. What do you consider the biggest advantage of this new service to banking? (Tick your answer, according to the fill instructions).

- Cost reduction
- Customer satisfaction
- Reduction of client influx to branches
- Speed of services provided
- Other

6. In terms of age, how has the adherence of bank customers regarding ICT been where you work? (Tick your answer for each item, considering a scale from 1 to 5 (1 = no adherence and 5 = maximum adherence).)

- | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------|
| 1 | 2 | 3 | 4 | 5 | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Less than 21 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 21-25 years |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 26-30 years |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 31-40 years |

- 41-50 years
- 51-60 years
- More than 60

7. What is the level of security that you associate with the new electronic distribution channels? (Tick your answer for each item, considering a scale from 1 to 5 (1 = no security and 5 = maximum security)).

- | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------------|
| 1 | 2 | 3 | 4 | 5 | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ATM |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Extranet |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Internet |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Mobile device (e.g. cell phone) |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Telephone |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Other |

8. What are the factors that facilitate innovation? (Tick the four most relevant factors, according to the fill instructions).

- Connectivity
- Customer relationship
- e-business
- Focus on business
- Global competitiveness
- Integration of value chain
- Search for business growth
- Other

9. What are the factors that impede innovation? (Tick the four most relevant factors, according to the fill instructions).

- Innovation costs
- Lack of appropriate sources of financing
- Lack of customer receptivity to new products
- Lack of information on markets
- Lack of information on technology
- Lack of qualified personnel
- Organizational structure less flexible
- Perception of excessive economic risks
- Standards and regulations too rigid
- Other

Group IV – Data on the respondent and the institution where he/she works

1. What is your gender? (Tick your answer, according to the fill instructions).

- Female
- Male

2. How old are you? (Tick your answer, according to the fill instructions).

- 21-24 years
- 25-30 years
- 31-40 years
- 41-50 years
- 51-60 years
- More than 60

3. What are your educational qualifications? (Tick your answer, according to the fill instructions).

- High School Education
- Bachelor
- Graduate
- Ph.D.
- Other

4. What is the scientific area of your qualification? (Tick your answer, according to the fill instructions).

- Economics
- Engineering
- Management
- Other

5. Indicate the name of the bank where you work:

<p>End of the Questionnaire</p> <p>Thank you for your cooperation.</p>
