Divergent Paths to a Network World. An Approach to the IT from Savings Banks Industry

J. Carles Maixé-Altés

University of A Coruna

9. November 2015

Divergent Paths to a Network World. An Approach to the IT from Savings Banks Industry[1]

J. Carles Maixé-Altés
University of A Coruna

Many topics within the history of information technology (IT) demand a detailed, historical assessment.[2] This paper will specifically offer two perspectives related to computing history: first, a demand-side approach that will analyze the use that specific users did of this technology and, second, an in-depth study of the processes of the spread of these technologies. As James W. Cortada has noted, any analysis of the deployment or diffusion of ICT must specifically consider both the client and the user while also remembering how IT spreads throughout the world much more quickly than other technologies have in recent centuries.[3] With this focus, this paper will examine the introduction of computers into retail banking precisely through one of its industries: the savings bank industry as it was configured in the developed world since the 1950s.

As many authors have noted, any investigation of how business and industry have used computer applications is a key factor in computing history.[4] The reference to industry is fundamental; as what is proposed here is an analysis of how computers have been used by an entire, specific industry as opposed to individual businesses.[5] Therefore, this paper will examine the savings bank industry, an industry that played a

[1] The author acknowledges the financial support from two MEC grants (Ministry of Economy and Competitiveness), Award number HAR2010-18544, sub programme HIST and HAR 2013-40760-R. Also he would like to acknowledge comments from Thomas Haigh and the rest of participants at the Session ‘‘Networks as Places in the History of Computing”, SHOT Annual Meeting- SHOT’10, Tacoma WA, US, November 2010; Session 6: “Global History of Services in the 20th century. Persistence and technological change”, 10th International Conference of Spanish Association of Economic History, Carmona (Seville), September 2011; and at the Session “IT in Economy and Banking”, HiNC4 – History of IT in the Nordics, Nordic Conference on IT History, Copenhagen, August 2014. He also thanks editor for the comments received and in the refereeing process that have improved the paper. The usual caveats apply.

[2] See James W. Cortada, "How did Computing Go Global? the Need for an Answer and a Research Agenda, "*Annals of the History of Computing, IEEE* 26, no. 1 (2004): 53-58; Bernardo Batiz-Lazo, J. Carles Maixé-Altés and Paul Thomes, "In Digital we Trust: The Computerisation of Retail Finance in Western Europe and North America," in *Technological Innovation in Retail Finance: International Historical Perspectives*, eds. Bernardo Batiz-Lazo, J. Carles Maixé-Altés and Paul Thomes (New York, London, 2011a), 3-12.

[3] James W. Cortada, *The Digital Flood: The Diffusion of Information Technology Across the U.S., Europe, and Asia* (New York, 2012), 32; J. W. Cortada, "Patterns and Practices in how Information Technology Spread Around the World," *Annals of the History of Computing, IEEE* 30, no. 4 (2008): 4-25.

[4] Ibid.

[5] JoAnne Yates, *Structuring the Information Age: Life Insurance and Technology in the Twentieth Century* (Baltimore, Md., 2005).

unique role in introducing computers into retail banking. The particular interest is supported in two respects: by its worldwide reach and by the collaborative strategies established between these credit institutions, which were created as non-profit financial institutions.[6] These strategies had a wide array of objectives; however, IT played a vital role in each strategy. This technological change was implemented chiefly through a fortuitous convergence of industry leader initiatives and through the efforts of national industry groups. The main development vehicle was the International Savings Banks Institute (ISBI), now known as the World Savings and Retail Banking Institute, which since the 1960s had an enormous impact upon the industry. Through meetings, seminars, periodic conferences and publications, they developed an extensive network comprised of representatives from national industry associations, corporate executives and experts connected with the computer industry.[7] The vast richness of these sources permits us to delve deep into the understanding of how IT expanded in the early days. These aspects of IT have already been contemplated previously and in relation to other industries as described by James W. Cortada in the three volumes of his work, *The Digital Hand*, or by JoAnne Yates in her work regarding life insurance companies.[8]

Conversely, the expansion and the use of computers around the world is a part of the process of technological diffusion. The need to carry out new studies that would verify whether the American experience is applicable to other regions has been repeatedly noted.[9] Therefore, the analysis of an industry with a strong collaborative tradition and with an entrenched presence in multiple countries throughout the world constitutes a good field of study to understand how information technology is spread and adopted by retail financial intermediaries.

Everett M. Rogers' point of view, expressed initially in 1962 and developed in various editions of his *Diffusion of Innovations*, considers this phenomenon to be a key factor in the processes of social change, a focus maintained in part by his foundation in

---

[6] The literature is substantial; in the next section and throughout the paper, the basic framework will be shown.

[7] Please see J. W. Cortada, "Studying the Role of IT in the Evolution of American Business Practices: A Way Forward," *Annals of the History of Computing, IEEE* 29, no. 4 (2007): 28-39 and "Patterns and Practices"; J. Carles Maixé-Altés, "La Opción tecnológica de las cajas de ahorro españolas antes de Internet, circa 1950-1995," *Investigaciones De Historia Económica - Economic History Research* 9, no. 2 (2013): 175-186.

[8] J. W. Cortada, "Looking at Technology through Industry Eyes," *Annals of the History of Computing, IEEE* 28, no. 2 (2006), 88; Yates, *Structuring the Information Age*.

[9] Cortada, "Studying the Role of IT" and "Patterns and Practices."

the theory of communication.[10] This approach interests us because it takes into consideration those who adopt new technologies. Furthermore, both the idea of technological adoption and the process of Americanization, as conceptualized by various authors, play a part in the processes of technological diffusion. From this point of view, the concept of diffusion may lead to another evocative concept in analytic terminology, the concept of appropriation.[11] This focus is very useful for the economic historian as it emphasizes, to a greater degree, the role performed by the technology end-user and considers the end-user to be more than just a simple user of said technology.[12]

The importance of the concept of appropriation as an analytical argument is reinforced if, within this study, countries at different stages of development are considered. The consideration of the technological gap that exists between countries is important for understanding the processes of diffusion, but one must not forget that the receiving country must begin under conditions that allow it to incorporate the new technology. In other words, receiving countries also have their own technological history and are also subject to previous experience, lessons learned and idiosyncratic factors that affect the adoption, use and development of the technology received. For this reason, a technological appropriation point of view is much more useful and flexible than other approaches. It takes into account both the roles of a technological provider and a technological end-user, and it furthermore considers the end-user of said technology to be an active player in the process, with adaptive and transformational capabilities.

Another topic to introduce is the fact that in computer technology, there is a difference between the product-system and product-application. The first aspect traditionally rested in the hands of the manufacturers. However, in the landscape of product-application, there was a field of action for businesses and for the computer-user industries. According to the now-classical categorization, all technology is usually

---

[10] Everett M. Rogers, *Diffusion of Innovations*, 5th ed. (New York, 2003).

[11] Mikael Hård and Andrew Jamison, "Conceptual Framework: Technology Debates as Appropriation Processes," in *The Intellectual Appropriation of Technology: Discourses on Modernity, 1900-1939*, eds. Mikael Hård and Andrew Jamison (Cambridge, Mass., 1998), 4-15.

[12] Mary Nolan, *Visions of Modernity: American Business and the Modernization of Germany* (New York, 1994), 324; Mikael Hård, "Technology as Practice - Local and Global Closure Processes in Diesel-Engine Design," *Social Studies of Science* 24, no. 3 (1994), 549-585; Ron Eglash et al., ed., *Appropriating Technology: Vernacular Science and Social Power* (Minneapolis, 2004); Gerard Alberts, "Appropriating America: Americanization in the History of European Computing," *Annals of the History of Computing, IEEE* 32, no. 2 (2010), 4-7.

considered to have two components, hardware and software: the first component is the aspect that considers technology as a material object, while the second component considers information as the basic tool.[13] Traditionally, the study of innovative software diffusion presents some problems as its adoption is often not easily traced. Nonetheless, this study discusses those topics as being within the realm of possibility.[14]

The point of view represented in this paper follows the trajectory plotted by Thomas J. Misa in the sense that the use of computers is often determined by different local and cultural circumstances.[15] If, in the final analysis, this paper attempts to answer the question "How have computers changed the world?", then undoubtedly an analysis of the industries that are users of said technologies and the equally international perspective can both contribute significant answers to this question. The concept of Atlantic continuity, sustained by the Chandlerian focus, acquires an even greater complexity if one introduces new agents into a world where countries, regions and cultural traditions interact and therefore also affect information technology, its use and its diffusion.[16] Many different fields of study come into contact at this point, at the heart of historical investigation. The analysis of Americanization, as initially suggested by Matthias Kipping and Ove Bjarnar, adheres to the approach of a series of authors who consider technology as a part of European integration.[17] This topic also intertwines with Gerard Alberts' concept, which tends to situate these two integration frameworks within a global perspective as this topic refers to both technology and to the processes of

---

[13] Rogers, *Diffusion of Innovations*, 13

[14] James W. Cortada, "Researching the History of Software from the 1960s," *IEEE Annals of the History of Computing* 24, no. 1 (2002), 72-79; Thomas Haigh, "A Veritable Bucket of Facts. Origins of the Data Base Management System," *ACM SIGMOD Record* 35, no. 2 (2006), 33-49.

[15] Thomas J. Misa, "Understanding 'how Computing has Changed the World'," *Annals of the History of Computing, IEEE* 29, no. 4 (2007), 52-63.

[16] Part of the ongoing Chandlerian debate considers the incidence of ICT revolutions in some aspects of his work, framing transaction costs in light of business capacities as vectors of technological change. See: Richard N. Langlois, *The Dynamics of Industrial Capitalism: Schumpeter, Chandler, and the New Economy* (London, 2007).; Naomi R. Lamoreaux, D. M. G. Raff and P. Temin, "Against Whig History," *Enterprise & Society* 5, no. 3 (2004), 376-387; Naomi R. Lamoreaux and Daniel M. G. Raff, *Coordination and Information: Historical Perspectives on the Organization of Enterprise* (Chicago, 1995).

[17] Thomas J. Misa and Johan Schot, "Inventing Europe: Technology and the Hidden Integration of Europe," *History and Technology* 21, no. 1 (2005), 1-19; Erik van der Vleuten and Arne Kaijser, "Prologue and Introduction. Transnatinal Networks and the Shaping of Contemporary Europe," in *Networking Europe. Transnational Infraestructures and the Shaping of Europe, 1850-2000,* eds. Erik van der Vleuten and Arne Kaijser (Sagamore Beach, MA, 2006), 1-22.; Alexander Gall, "Atlantropa. A Technological Vision of a United Europe," in , eds. Erik van der Vleuten and Arne Kaijser, 99-127; Leonard Laborie, "A Missing Link? Telecomunication Networks and European Integration 1945-1970," eds. Erik van der Vleuten and Arne Kaijser, 187-215.

diffusion and appropriation.[18] This paper, through the lens of economic and business history, permits us to observe a pan-European user network as well as the diffusion of information technology. Transatlantic providers operate and interact within this information technology, as do European manufacturing businesses and the end-user businesses of said information technology. Foreign technology adapts to local uses, and local use and demand in turn influence the technology suppliers, be they autochthonous or international suppliers. This study provides information on how the process of technological globalization was implemented prior to the Internet and what its limits were, which certainly helps to understand how computers are changing the world.

In terms of documentation, primary sources have been incorporated. These have a solid foundation in proceedings, publications, minutes and reports generated by ISBI international committees on automation and related associations between 1960 and 1990. It has also been possible to access first-hand material from the institutions themselves, along with specific reports made public by government agencies. Likewise, this study has used more current, secondary sources and interviews with the persons involved in the creation and development of this technological change.

The proposed topic will be expanded in the following fashion; the second section outlines a brief overview of these institutions, the third section investigates the early developments in savings bank office automation, and the fourth addresses the emergent collaborative strategies of the industry, followed by an overview of the role played by teleprocessing and electronic funds transfers in retail banking in the years prior to the Internet. Conclusions will be presented in the last section.

Idiosyncrasies of the savings bank industry

For very few years, between 1810 and 1825, savings banks successfully emerged in various parts of the world. By the mid-19th century, these non-profit banks were firmly established in Europe, in the United States and in Australia. In 1838 and in 1844, the first banks were established in Spain and in Portugal, countries where their arrival was somewhat delayed compared with the pioneers. A little while later, near the mid-century mark, the first Latin-American banks were established in Cuba and in Puerto

[18] Alberts, “Appropriating America.”

Rico. By the end of the century, savings banks stood out as a form of retail banking that served the financial needs of ordinary individuals.[19]

In the interbellum years, the associative and organizational capacities of the savings banks were mature enough for them to strengthen their position in the face of regulation; they could compete with other financial intermediaries, and they could further develop their technological, marketing and management strategies. This momentum proceeded along two courses of action: one involved the development of industry associations, and the other implemented central savings banks, which operated as wholesalers of retail finance with clearing functions (see Table 1). Great divergences occurred on both sides of the Atlantic resulting from the inability of the American companies to develop a framework similar to their European counterparts, fundamentally due to the fragmentation of the institutional structure of personal finance in the US.[20] A key development in the phenomenon of association between savings banks was the inauguration of the First International Thrift Congress (Milan, October 1924), which would lead to the birth of the ISBI, the body that consisted of a significant portion of savings banks worldwide.

Table 1

Post-war growth and the so-called “economic miracles” in various European countries stimulated broad access to financial services in the general population. Savings banks rolled out strategies to offer new products for consumer credit and mortgage credit. Likewise, increased savings amounts and a more developed payment system accelerated the volume of transactions handled by the banking system. This accelerated volume resulted from the direct-deposit payrolls and receipts from public utility companies, which generated strong demands for transfer services.[21] All of these factors supported their stake as a technologically advanced industry and enabled them to further develop themselves competitively at a time when their primary market was expanding.

---

[19] R. Sylla, "Financial Systems and Economic Modernization," *Journal of Economic History* 62, no. 2 (2002), 277-292.

[20] R. Daniel Wadhwani, "Organisational Form and Industry Emergence: Nonprofit and Mutual Firms in the Development of the US Personal Finance Industry," *Business History* 53, no. 7 (2011), 1152-1177.

[21] Payment System Incorporated, “Preauthorized Payroll Deposits,” *Reistad Research Report, Payment Systems Perspective no. 1.* (New York, March 1971); Jack Revell, *The Future of Savings Banks. A Study of Spain and the Rest of Europe* (Bangor: Institute of European Finance, University College of North Wales, 1989).

The banks experienced expansion in most of the countries where they had taken root until the 1980s (in 1987, market shares of savings banks and mutual fund deposits reached 64.1% in Germany, 48.9% in France, 39.7% in Italy, 42.6% in Norway, 40.5% in Sweden, 39.1% in Spain, 34.6% in the Netherlands, 27.4% in Denmark and 16.8% in Belgium).[22] At that point, a new era was established and characterized by changes at the regulatory level, greater competency, financial disintermediation and, consequently, an intense process of demutualization.[23] In Europe, only the Central European, (especially the) German, Nordic and Spanish banks remained unscathed by this upheaval. However, these latter banks have succumbed to the shock of the 2008 crisis. In the United States, the turning point came with the crisis of the savings banks in the 1980s.

Early developments in savings bank office automation

In Europe, the technological change in the banking sector was led by the commercial banks during the interbellum years. Banks incorporated mechanical calculating machines, book-keeping machines and other electro-mechanical devices (unit record equipment) for back-office management. They expanded the use of tabular bookkeeping of the European and American variety (Astra, Rheinmetal, Borroughs, NCR, Remington and MADAS).[24] Savings banks adopted these processes in the post-war period. This comparative delay allowed some companies to incorporate the next generation of machines, what are now considered as the first forays into the field of digital computing technologies. This chronology shows similarities throughout all of Europe.[25]

---

[22] Ibid.

[23] R. Martin and D. Turner, "Demutualization and the Remapping of Financial Landscapes," *Transactions of the Institute of British Geographers* 25, no. 2 (2000), 221-241.

[24] Lars Heide, *Punched-Card Systems and the Early Information Explosion, 1880-1945* (Baltimore, 2009), 122, 193-194; Bernardo Batiz-Lazo, J. Carles Maixé-Altés and Paul Thomes, eds., *Technological Innovation in Retail Finance: International Historical Perspectives*, (New York, 2011b), 319; Hubert Bonin, "From Prehistory to the History of Computer in Banking: Mecanization of Data Processing and Accounting Methods in French Banks, Circa 1930-1950," eds. Bernardo Batiz-Lazo, J. Carles Maixé-Altés and Paul Thomes, 25.; Alan Booth, *The Management of Technical Change : Automation in the UK and USA since 1950* (Basingstoke, 2007), 126, 142; Peter Wardley, "The Commercial Banking Industry and its Part in the Emergence of the Corporate Economy in Britain before 1940," *Journal of Industrial History* 3 (2000), 71-97.

[25] Bernardo Bátiz-Lazo and Peter Wardley, "Banking on Change: Information Systems and Technologies in UK High Street Banking 1919-69," *Financial History Review* 14, no. 2 (2007), 177-205; Bernardo Batiz-Lazo and J. Carles Maixe-Altes, "Managing Technological Change by Committee: Adoption of Computers in Spanish and British Savings Banks (Circa 1960-1988)," *Revista De Historia Industrial*, no. 47 (2011), 117-150.

Table 2 presents the case of four European banks that are representative of the mechanization processes of the post-war years (Italy, Switzerland, France and Spain). This sample is comprised of the banks visited by two commissioners from the Board of Directors of the main Spanish savings bank, the Pension and Retirement Savings Bank of Cataluña and the Balearic Islands (Caja de Pensiones para la Vejez y Ahorros de Cataluña y Baleares - CPVA), in 1958. The three savings banks were chosen because of their degree of technological implementation at a time when the CPVA (known in 1975 as "la Caixa" and today as CaixaBank) proposed a shift in their technological structure, which was as antiquated as were the rest of the Spanish banks.[26] The sample characteristics reflect how the automation movement in the banks was not strictly determined by size, by number or by the complexity of the transactions conducted.

The modernization process in Italy was led by the Cassa de Risparmio delle Provincie Lombarde (CARIPLO). Headquartered in Milan, CARIPLO had more than 2.5 million customers, an extensive network of branch offices and a diversified business operation. In 1948, they had installed the newly built IBM 604 Electronic Calculating Punch. The new IBM model enabled four mathematical operations at a much faster pace than previous electro mechanic models. The model belonged to the product line from IBM that incorporated the modular, vacuum-tube based, pluggable units (which would later be the basis for the first generation of digital computers such as the IBM 650, which entered the market in 1954).[27]

The CARIPLO case is a good illustration of the dynamic of technological options for larger companies prior to the computer era. Choosing any specific model was subject to a system of trial-and-error. In fact, one decade after the arrival of the IBM 604, the accounting arm of the company was highly dysfunctional. They had created bottle-necks in their administrative and accounting processes, derived from an only partial application of the electronic system. Moreover, the core services lacked the organizational capacity necessary to centrally manage branch office operations. This situation reached critical mass, and in 1959 they chose to install new equipment. Note that this happened with the *first* generation of computers, the aforementioned IBM 650,

[26] AHC ("la Caixa" Archive), Report to the Board of Directors about the visit to Europe by the commissioners of the Board, 7 January 1959.
[27] AHC, Report to the Board of Directors. William D. Bell, "The 'DUZ' General-Purpose Control Panel for the IBM Type 604 Electronic Calculator," *IBM Technical Newsletter* 1, no. June (1950), 9-11; Yates, *Structuring the Information Age*, 115.

and also required a complete overhaul of the administrative and accounting operations of the company itself. [28]

Table 2

Other banks, such as the smaller bank of Geneva, Caisse d'épargne de la République et Canton de Genève (with approximately 123,000 customers), were more cautious; in 1958, a decade after CARIPLO, this particular entity also opted for an IBM 604. However, they did not make the same mistakes. In this case, they created a completely integrated and mechanized system. The IBM electronic calculating punch was installed along with two National 2000 (NCR) models with five-channel teletype, which allowed, via an alphanumeric keyboard, data entry for every operation (simultaneously imprinting the operation on the customer receipt-book and storing the data on the papertape).[29] This system eliminated the manual perforation that continued to be practiced in other banks. The results were noteworthy, and among other matters, they were able to have the end-of-year balances ready in five days' time with the help of only five employees (the previous Burroughs system had demanded a workload of 45 days for 25 employees).[30]

In France, the Lyon bank had begun their mechanization in 1951, utilizing the French-made system produced by the Compagnie des Machines Bull (punched cards). They were much smaller than both CARIPLO and CPVA, and their business model was just as basic as their British counterparts, the Trustee Savings Banks, TSBs (Table 2). However, they also chose technological change, even though the reasons for this choice were different than those of the big banks. According to their director, Léon Rigot-Muller (1945-1973), in 1957, "The punched cards system […] solves the serious problem of the volume of operations, specifically the problem of small-amount impositions".[31] In other words, the choice to mechanize the European banks sat between two poles: on one end, business volume and diversification and, on the other end, a higher volume of small-amount operations and scarce diversification. On each pole, mechanization was deemed necessary. There were few doubts when it came time to select the equipment, either. The end-users suggested that there were no large differences between the performance of IBM or the Bull. For example, the opinion from the director of the savings bank in Geneva, Mr. Rangemont, was that given the similar

[28] AHC, Report to the Board of Directors.
[29] The first models appeared in 1922 and were mainstays until the beginning of the 1970s.
[30] AHC, Report to the Board of Directors.
[31] Ibid.

options, the Board of Directors opted for the IBM machine as it "offered quicker guarantees for cleaning service, repairs and obtaining replacement parts".[32]

This chronology also repeats itself for the rest of Europe. The German savings banks, which before the war had been early technology users, despite the terrible consequences of the conflict, recuperated that trajectory after the war. The Kreissparkasse Saarbrücken (DSB), a district savings bank incorporated in 1948, punched cards with bookkeeping equipment supplied by Dehomag. Their local competitor, the Stadtsparkasse Saarbrücken (CSB), did not do so until 1955, and other banks waited even longer. As Paul Thomes has noted, the German banks experienced the positive influence of know-how on behalf of their staff, and some of those banks led the processes of change.[33] Some Swedish banks, such as the banks in Stockholm and the bank in Gothenburg, implemented the mechanization process throughout the 1950s; the rest did so towards the end of that decade.[34] The bank in The Hague (Netherlands), for example, installed electronic accounting in 1957.[35]

In observing the delay between the savings banks and the commercial banks, the documented cases seem to confirm how, after the war, one sees a dual tendency in the modernization patterns of the savings bank industry. One, a traditional mode that supported the electromechanical systems (such as that of the Spanish CPVA) until the end of the 1950s; and two, an innovative mode that incorporated punch-card-based bookkeeping and even some machines that were a bridge to the first generation of computers (CARIPLO and some German and Nordic banks). The different cases studied demonstrate the flexibility with which the end-users greeted the technological offerings in the transition to the computer era. The case of the European savings banks confirms the tendency JoAnne Yates detected in the United States within the insurance industry: "This reciprocal influence between technology artifacts and their use also appeared in the early computer era."[36]

The golden age of savings banks automation: a world collaborative consortium

[32] Ibid.
[33] Thomes, *Is there an ICT Path*, 119-136
[34] Ingvar Körberg, *Förnyelsen: Sparbankernas Historia 1945-1980* (Stockholm, 2006).
[35] E. Herrera, "Modernización, racionalización, mecanización," *Boletín CPVA*, November (1958), 6.
[36] Yates, *Structuring the Information Age*, 256.

The introduction of IT into retail banking revolved around three fundamental axes. First, digital computers arrived under different adoption models, sometimes installed through the initiative of the institutions themselves and other times using shared infrastructures such as data center companies. Second, the transfer of off-line processes to a range of on-line processes enabled the Electronic Data Processing (EDP) networks to transform the industry. Finally, the innovations produced within the payment system accelerated the growth of IT in retail banking. These events, while not the only ones, will be utilized in this paper as principal indicators of the routes followed by the industry in its computer adoption and deployment process.

Organizing IT implementation in the industry. The collaborative technology process in the savings banks started to implement itself after the Second World War, and they intensified with the creation, in 1957, of the European Economic Community (EEC). Some European members of the ISBI pondered the need to create a European lobbying group for the banks; the first steps were taken by the German Savings Banks Association, which opened an EEC liaison office in Brussels. Not long afterwards, on the 23rd of April, 1963, the national associations of savings banks of the six founding nations of the EEC created the Savings Banks Group of the EEC (known since 1988 as the European Savings Banks Group, ESBG).[37]

J. Yates, B. Bátiz-Lazo and J.C. Maixé-Altés have noted the fundamental role played by technology committees in implementing information technology processes at the companies making up these industries.[38] The ISBI structure provided a strong cover for said committees. Under their corporate bodies, they established five Permanent Committees: the Savings Banks Central Banks Committee, the Development Cooperation Committee, the Business Organization and Automation Committee (BOAC), the Marketing and Publicity Committee and the Education Committee. Under the supervision of these permanent committees, different ad hoc working groups built a collaborative structure for ISBI members. It is worth highlighting the effects of BOAC activity. It has its beginnings at the end of the 1950s, actively operating as the Study Group on Automation. In 1961, by then known as BOAC, it began promoting the International Conferences on Automation, which occurred in 1965 and were the genuine catalysts for technological collaboration in the industry. Between February 1971 and

[37] ESBG corporate website. Available from: http://www.wsbi-esbg.org/Who-we-are/About-ESBG/Pages/ESBGHistory.aspx (accessed on 9 July 2015).
[38] Ibid.; Batiz-Lazo and Maixe-Altes, "Managing Technological Change by Committee."

October 1985, they organized 32 international meetings (in European and American capitals as well as in Japan), in other words, averaging 2.3 meetings per year. Likewise, and from the early 1970s on, other working groups began to operate: the Payment Systems Working Group, the Terminal Projects Working Group, the Data Center Working Group, the Customer and Management Information Systems Working Group, the Security Working Group and the Cash Dispensers Working Group, all of which relied directly upon the BOAC.[39]

This collaborative mentality was deeply rooted in the savings bank tradition. The words of the ISBI President Per Olov Rimvall of Sweden from the early 1970s attest to this fact:

> "The Chairman stressed that co-operation is vital for savings banks to express their own opinion as distinct from that of commercial banks so that their own ideas be taken into consideration in the international negotiations in the banking field".[40]

Different infrastructures: Owning computers versus data center organization. The introduction of first and second-generation computers was closely related to the expansion of data centers. However, one could say these centers only expanded due to the rollout of third-generation mainframe computers and the industrial use of IT. These large-scale computers needed to be located within appropriate infrastructures, the so-called data centers.[41] The first banking data centers in Europe opened thanks to second-generation computers. These movements were led by the strongest and most advanced enterprises implementing their own computing resources. In 1961, Barclays activated the first financial data processing center in Great Britain, installing an IBM 1401.[42] Shortly after, a few German banks launched their first shared data center, and, in 1962, the CPVA opened their first computer center in Barcelona, which housed an IBM 1410.[43]

Table 3

Access to digital computing among the savings banks on both sides of the Atlantic was a phenomenon that slowly reached critical mass throughout the 1960s. Analytically,

---

[39] ISBI. Minutes of Working Groups (1965-1985).
[40] ISBI. Procedings of 5th Conference on Automation, Vienna 9-10 November 1971.
[41] Rihards Balodis and Inara Opmane, "History of Data Centre Development," in *Reflections on the History of Computing : Preserving Memories and Sharing Stories*, ed. Arthur Tatnall (Heidelberg, 2012).
[42] Ian Martin, "Britain's First Computer Centre for Banking: What did this Building do?" eds. Bernardo Batiz-Lazo, J. Carles Maixé-Altés and Paul Thomes, 37-70.
[43] ISBI, German Papers of the 5th Conference on Automation. J. Carles Maixé-Altés, *Innovación y compromiso social. 60 años de informatización y crecimiento, 1950-2011* (Barcelona, 2012).

it is necessary to consider those enterprises with their own EDP resources (Table 3) and, alternately, the Savings Bank Data Center Companies (Table 4). Table 3 shows how those countries that had a larger concentration of savings banks with their own EDP systems beginning in 1969 were Italy, Spain, Germany and the United States. The computerization process accelerated as, in 1971, 70% of the Italian and Spanish savings banks, and 75% of the American savings banks already had their own EDP resources at their disposal. The rest of the countries studied had a lower percentage of banks with their own computer resources by 1969. However, that does not mean that those banks were adverse to the adoption of new technologies, but instead that their EDP services were being provided by the savings banks data center companies to a greater extent (see Table 4). As correctly demonstrated by the Austrian SPARDAT representative: "It was realized that institutes too small to justify the use of their own EDP plant had the same need for information as the large-scale institutions".[44]

This diversity resulted from the different industry morphology in Europe and in the U.S. While there were fewer savings banks in Italy and in Spain, the larger savings banks flourished with their greater branch networks that were in some cases regional in size. Along with these large banks, there was also a plethora of provincial banks – of medium and smaller size. However, in Central Europe, the dimorphism was more pronounced and more prevalent; most savings banks were smaller and had only a local influence even though the larger savings banks carried their own weight. In the Atlantic and Nordic regions of Europe, medium-sized savings banks abounded. Finally, in the U.S., enterprises did not benefit from greater branch networks, even though they managed investments for a significant number of clients.[45] Empirical evidence demonstrates how the smaller banks had a greater propensity for adopting computers via shared data centers, while the larger banks were self-sufficient.

Table 4

An intermediate option was to rely upon a manufacturer's service bureau or upon a non-savings bank institution. Their function was similar to the others, but their

[44] Created in in 1968, Sparkassen-Datendienst agglutinated the interests of the small banks in collaboration with the Central Savings Bank (5th Coference on Automation, Vienna, 1971).
[45] P. E. Larsen (Nyköbing), "EDP Cooperation between Nordic Countries," and J. W. Petrusky (New York), "Further Trends in Information Technology. Fourth Generation Hardware. How will these Changes Affect Bank Automation?", 5th Conference on Automation, Vienna, 9-10 November 1971.

services were less in-demand from the savings banks.[46] Altogether, the studied cases represent inter-industrial synergies that emerged, in large part, from European countries where EDP resources were introduced in savings banks. The different options demonstrate the various paths taken, and the roles different national industry structures played in implementation.

Electronic data processing and Teleprocessing

Beginning in the early 1960s, the first attempts at digital information transfer between computers took place. A definitive launch and expansion would occur thanks to the third-generation computers, especially the 360 series from IBM, beginning in 1964 (it has been suggested that this model was to the computer industry what the Ford Model-T was to the automobile industry). This series model and the later series models – the so-called "on-line" systems, followed by the "on-line, real-time" (OLRT) systems – all had a major boost.[47] They were connected by the analog telephone and telegraph lines (point-to-point lines), using modulation-demodulation equipment (modems) that converted the signal from analog to digital and vice versa.

The bank information transmission lines, which were developed in the second half of the 1960s, created new needs. Two network nodes established a dedicated communication channel (circuit switching network), using this to connect computers that acted as the hub of the network (switching nodes) and that also linked together via the aforementioned lines to the end-terminals (branch teller terminals).[48]

Simultaneously, in the American academic and military settings during the mid-1960s, a new information transfer technology was developed: ARPANET, which would later give rise to the worldwide public information network known as the Internet. They fragmented the information into data packets that were sent through the network by a range of pathways and then later regrouped in the end-terminal (packet switching

[46] ISBI, Automation in Savings Banks, Situation report at the beginning of 1969, Results of an Investigation, Amsterdam, 1969. ISBI, Minutes of the 4th Meeting of the Business Organization and Automation Committee, Frankfurt, 2 February 1972.

[47] I. Martin, "Too Far Ahead of its Time: Barclays, Burroughs, and Real-Time Banking," *Annals of the History of Computing, IEEE* 34, no. 2 (2012), 5-19. Bernardo Bátiz-Lazo, Tobias Karlsson and Björn Thodenius, "The Origins of the Cashless Society: Cash Dispensers, Direct to Account Payments and the Development of On-Line Real-Time Networks, c. 1965-1985," *Essays in Economic & Business History* 32 (2014), 100-137.

[48] Jorge Infante, "El Desarrollo de la Red Pública de Datos en España (1971-1991): un caso de avance tecnológico en condiciones adversas," *BIT Digital* 136 (Noviembre, 2002), 1-20; Maixé-Altés, *La opción tecnológica de las cajas de ahorro*, 175-186

network). In this way, a single link could be shared (the experimental network Mark I, in the UK, was created with similar characteristics).[49] From the beginning, the packet switching networks intended to optimize the use of communication mediums to increase their speed and performance. The introduction of this technology among telecommunications operators was late, with public networks based upon packet switching not taking general effect until the 1980s (they took their first steps in the U.S. in 1975 as TYMNET/TELENET; in Canada in 1977 as GLOBEDAT; in Germany, Holland and the U.K. in 1981 with the DATEX-P, DN-I and PSS networks, respectively; and the rest of the countries incorporated this system successively).[50]

However, a very remarkable exception occurred, one that illustrated the complexity and diversity of the technological diffusion processes. This refers to the case of a pioneering development of a public, nationwide, packet switching network in Spain in 1971. It was the first of its kind in the world,[51] developed by the public telephone operator, the Spanish National Telephone Company (Compañía Telefónica Nacional de España – CTNE, since 1984 known as Telefónica).[52] This network was an exceptional achievement in data transfer systems in Spain and was closely connected to the demand of the financial and banking sector as the big end-users. In July of 1971, the Special Data Transmission Network (Red Especial de Transmisión de Datos – RETD) was established, using as its communication nodes the Univac 418 III computers and a combination of protocols named the High Level Secondary Network (Red Secundaria de Alto Nivel – RSAN); these were designed and developed by CTNE engineers and based on the experimental principles of ARPANET.[53] The Spanish industry reached exceptional heights within this advanced technological field, but unfortunately, as a consequence of weak foreign engagement during those years, that pioneering sector ended up succumbing to international competition.

---

[49] Paul E. Ceruzzi, "The Internet before Commercialization," in *The Internet and American Business*, eds. W. Aspray and Paul E. Ceruzzi (Cambridge, Mass., 2008), 9-43.; Janet Abbate, "Building the ARPANET: Challenges and Strategies," in *Inventing the Internet* (Cambridge, Mass, 1999), 44-81.

[50] Ministry of Transport, Tourism and Communications, Annual Report, Madrid, 1987.

[51] The first public data transmission network was installed in Germany in 1969, applying the circuit switching technology: Luis Martínez Miguez, "La Transmisión De Datos En España," *Boletin De Ingenieros De Telecomunicación (Telecommunications Engineers Bulletin)* 38 (1985), 45-54.

[52] Oscar Martín Bernal and M. Rodríguez Jiménez, *25 Años De Transmisión De Datos* (Madrid, 1998); Maixé-Altés, "La opción tecnológica de las cajas de ahorro," 175-186

[53] Four engineers of the Computing Division of the CTNE visited the US to study the Western Union circuit switching network and the American Bank Association message communication network, which followed the design of ARPANET, Martín Bernal and Rodríguez Jiménez, *25 Años De Transmisión De Datos*.

Teleprocessing. One of the topics that was repeatedly suggested with increasing intensity in the European banks during the second half of the 1960s was the so-called banking teleprocess, or what is also known as communication between computers and teller terminals.[54] Teleprocessing was key to the evolution of the automated processes in retail banking, as it affected internal information systems, access to office and branch networks, and definitively affected customer relations. Notwithstanding, and from the point of view of the banking industry, these developments followed somewhat different courses than similar developments in the manufacturing industries and within other sectors of the service industry (such as reservation systems for airlines and hotels in US and Europe[55]).

The concept and application of the on-line processes in the banking industry sprang from, early on, the need to automate and centralize the information exchange processes between the branch and main office balance sheets. The objective was to obtain centralized data – "daily" – of transactions in every customer account.[56] As the ISBI reports highlight, at this point in time, on-line processes should be understood as an evolution of office automation alongside batch-oriented accounting. Thus, this meant evolving off-line processes, in which banks undertook actual physical transportation of the punch-cards or of the information files so that they could be processed by the central computer. The "on-line" designation had to do with how the transfer, during this new era, took place through point-to-point lines so that the information could be processed later by the central computer (hence the use of asynchronous computer systems and batch processing).[57]

The data from Table 3 reflect the moment when the on-line systems were implemented in those more dynamic, larger enterprises. Initially, the on-line teller terminals were installed in the main office and in the more important branch offices. These results must be considered as the first era of on-line processes, while these processes had already transpired in retail banking from the mid-60s to the end of the

---

[54] From the early stages of banking information transfer until the end of the 1980s, the term teleprocessing was most often used by experts (*télétraitement* in French, *teleproceso* in Spanish and *datenfernverarbeitung* in German). Other common terms were computers and comunications (CC), IT and telematics.

[55] Susan V. Scott and Markos Zachariadis, *The Society for Worldwide Interbank Financial Telecommunication (SWIFT): Cooperative Governance for Network Innovation, Standards, and Community*, Vol. 83 (London, 2013), 52

[56] Maixé-Altés, "La opción tecnológica de las cajas de ahorro"; Martin, "Too Far Ahead of its Time".

[57] ISBI, Report of proceedings 11th. Meeting of Study Group of Automation, Copenhagen, 26-27 November 1968. ISBI, Compte rendu, 4e. Conference Internationale d'Automation, Sitges (Barcelona), 21-23 October 1969.

1970s. From the operational point of view, the first on-line processes in the savings banks involved customer savings and checking accounts, which accounted for the bulk of their business. From that point, they began to introduce other operations; Spanish and Swedish banks soon introduced loan accounts, while some Italian banks automated the administration of public financial founds and the collection of taxes, and a few Austrian banks even automated traveler's payment media. However, at the European level, the primary factor was to centralize branch operations.

In short, what various ISBI technology committees document is how the launch of on-line processes was not focused on creating databases to serve Management Information Systems (a topic that remained technically and organizationally underdeveloped, as noted by Tomas Haigh).[58] Nor can one deduce that bank priorities were to connect the cash dispenser networks.[59] Rather, what one can deduce is how the banks were creating an interconnected system that hinged on the Line Control Programs (LCP), with the purpose of integrating some of the operations from offices that were distant from one another.[60] The key problem of teleprocessing was the creation of transmission lines, which, on the one hand, generated an increased demand for programmers knowledgeable of the new languages and, on the other hand, involved an economic cost resulting from the dependence on telephone companies, electricity providers and computer manufacturers, particularly IBM.[61] Savings banks only solved this quandary thanks to intra-industry collaboration and, particularly, by focusing on technological collaboration between providers and the enterprises involved. In the early phase, when it was necessary to design specific teleprocessing software as they progressed (ad hoc programs), software designers from the manufacturers worked in close collaboration with their banking clients.[62]

By the mid-1970s, a new teleprocessing era had begun. The LCP gave way to Terminal Control Programs (TCP), now adapted to a new form of teleprocessing lines, called "high speed," or BSC lines. A new breakthrough in data transmission was being

---

[58] Haigh, *"A Veritable Bucket of Facts"*, 33-49

[59] Bátiz-Lazo, Karlsson and Thodenius, "The Origins of the Cashless Society".

[60] This can also be deduced from Martin in "Too Far Ahead of its Time," regarding British Banks, although in the end the experience of Barclays did not have immediate consequences..

[61] ISBI, Report of proceedings 11th. Meeting of Study Group of Automation, and Compte rendu, 4e. Conference Internationale d'Automation.

[62] J. Ruiz Kaiser (Head of Computer Department, c. 1960s and Deputy general Manager, c. 1970s-1980s at "la Caixa"), interview, Barcelona,13 April 2011. J. Esteve (Director of Computer Department, CECA, c. 1970s-1990s), interview, Madrid, 25 September 2007. J. Munt Alvareda (IBM Marketing executive for "la Caixa" and Director of Systems IBM-Barcelona, c. 1960s-1980s), interview, Barcelona, 14 June 2011. Martin, "Too Far Ahead of its Time," 5-19. Maixé-Altés, *Innovación y compromiso social*, 161-170

developed, one which progressively introduced synchronous communication processes into a segment of enterprise operations, the so-called OLRT processes.[63] This technology introduced continual transmission, simultaneously requiring further economic investment as well as software and hardware innovation and more stable teleprocessing lines.[64] In terms of software, the larger savings banks were introducing new computer architecture, including operating systems such as the MVS (Multiple Virtual Storage), which offered multitasking capabilities in executing different programs in addition to their standard function as double-processor.[65] At this juncture, they were also rolling out 'Easytrieve' (a programming language designed to obtain reports that was easy to program but that did not require compiling).[66] In reality, what some savings banks were introducing was a new, more universally standardized teleprocessing system with the capacity to sustain networks as they continued to grow. In this landscape, IBM had a noticeable impact on some European banks with the installation of the IMS FastPath for the Z/OS System, a database and teleprocessing management system from IBM that continued to operate throughout the 1980s. The second era of teleprocessing in the banking industry was characterized by broadening the on-line processes and the gradual introduction of OLRT in certain parts of banking operations, as documented by ISBI committees.

The evidence presented suggests how the retail banking sector examined here did not adhere to the hypothesis proposed by Susan V. Scott and Markos Zacariadis, "that financial services tend to borrow technological and operations solutions from other sectors rather than innovate bespoke information and communication systems for themselves".[67] In short, it is another example of the diversity of pathways in the diffusion of computer technology around de world.

Electronic Funds Transfers and the new services of the pre-Internet years

At the beginning of the 1970s, the American thrift banks became aware of the changes being made within payment exchange systems and their resulting impact upon retail banking. For that reason, they pushed to offer their customers third-party payment

[63] Ibid.
[64] R. Wild (London), "Report about Terminals," 5th Conference on Automation; ISBI, How to Run a Data Centre Efficiently - Batch Operations, Report of the Data Centres Working Group, Geneve, 1972.
[65] AHC, Computers Department, Projects: White Book, October-November 1979.
[66] Ibid. Haigh, "A Veritable Bucket of Facts," 33-49
[67] Scott and Zachariadis, *The Society for Worldwide Interbank Financial Telecommunication (SWIFT)*, 38

instruments; in this way, they could tap the credit card market from their position in retail banking.[68] The European savings banks also became interested in these American initiatives. An indicator of this attitude was the impact of the reports from the American Bankers Association's Monetary and Payment System Planning Committee (ABA's MAPS Committee), which circulated throughout the different ISBI commissions.[69]

Clearing structures and payments systems. Many of the Central Savings Banks and Savings Banks Data Center Companies were interested in the developments in Savings Bank Clearinghouse Systems as both message exchange networks and a basis for future inter-bank networks. From the mid-1970s, inroads continued to be made in this field, especially in Belgium, the Federal Republic of Germany, Japan and Spain (see table 5). In fact, at the beginning of the 1980s, ISBI actively participated in the ISO commissions with regard to the topics of EFT standards and the message transmission being developed by SWIFT.[70]

Table 5

Concurrently, as these clearing structures were being established, the cash dispenser and EFTPOS networks were also being expanded. The first banks to experience these related problems in Europe were the Nordic savings banks, and the resulting experience of Nordisk Spardata (NS) throughout the Scandinavian countries encouraged new projects.[71] Towards the end of 1971, Peder E. Larsen, Chairman of NS, was saying:

> Nordic cooperation is expected to be further expanded within an extremely interesting field, namely arrangements of payment systems, and here each country is presently engaged in a national research work.[72]

The Swedish banks created their own card network, MINIBANK, which in 1978 had distributed approximately 800,000 cards.[73] The remaining Nordic countries gradually incorporated these practices through 1974 and 1975 (table 5). Finally, despite various competition issues, in September of 1983, they released in Denmark the first Bankort card, supported by the joint Company Pengeinstitutternes Købe-og Kreditkort (PKK),

---

[68] *Banking* 69, no. 9 (1977), 12.
[69] ISBI, Final report MAPS Committee, March 1970 (mimeo). Gary Arlen, "MAPS committee warns: plan now for electronics payments systems," *Banking* 63, no. 12 (1971), 54.
[70] ISBI, "Standarization in Banking, Bank Telecommunication Messages [TC68/SC5]: Part 1 Funds Transfers Messages," (DP 7882/1, Geneve, 16-03-1983).
[71] J. Carles Maixé-Altés, "ICT the Nordic Way and European Retail Banking," in *History of Nordic Computing 4*, eds. Chr. Gram, Soren Duus Ostergaard and Lars Heide (Heidelberg, 2015).
[72] ISBI, Procedings of the 5th Conference on Automation, Vienna 9-10 November 1971.
[73] ISBI, Minutes of the 17th Meeting of the BOAC, Stockholm, 10-11 May 1978.

which owned both the network and the marketing rights and which would make way for future ATM and POS network developments.[74]

Another case of expansion of a bank-owned network was the Spanish Tarjeta 6000, supported by the savings bank industry association, CECA, which in 1978 had distributed 230,000 cards with 110,000 businesses signed on to the system.[75] Throughout the rest of Europe, during the same time, countries such as Belgium were developing a Cash Dispenser Joint Network between the savings banks and the larger commercial banks. While this project was important, the greater interest of the pool was focused upon the development of an EFTPOS system, a project particularly desired by the savings banks as a means of access to retailers.[76] In Italy, STACRI (the Savings bank giro/message-switching network) would also serve to support future EFTPOS expansion.[77] The French case presented its own unique characteristics. The Caisses d'Epargne maintained a certain reluctance toward renovating their operations; however, the French Post Office actively participated in the developments of the inter-bank organization Carte Bleu, and in other initiatives as well (table 5). In the U.K., between 1982 and 1983, the agreements between the TSBs and the clearing banks (National Westminster and Midland) were leading to a joint network of cash dispenser services, which, already contained 400 ATMs throughout the country in 1983. Steps were also jointly being taken towards a national network for POS (a creation of the Policy Committee and Technical Working Party).[78]

New services and digitalization. Both in the U.S. and in Europe, the pressure from non-banks was shrinking the competitive market for payment systems and cards. In the second half of the 1980s, the landscape for EDP had changed, and the banking strategy was evolving, according to J. Mohren (Girozentrale in Berlin):

> In the beginning, the implementation of EDP and automation in banks was largely concentrated in the area inside the bank. Since then, EDP technology –the most significant factor in reducing operating costs and increasing productivity– has also entered directly into the marketing domain.[79]

In many banks, they discussed multiple ideas related to Videotex and Home Banking. The more advanced developments occurred in Germany, Denmark, Italy, Japan and the

---

[74] ISBI, Minutes of the 26th Meeting of the BOAC, Londres, September 30-October 1, 1982 (BA-283).
[75] Annual Report CECA, Madrid, 1978.
[76] ISBI, Minutes of the 17th Meeting of the BOAC
[77] Summary of Reports on Members Countries (C.A. Lequio, Rome), Ibid.
[78] ISBI, Minutes of the 26th Meeting of the BOAC.
[79] J. Mohren, "Service or Self-Service in Banking: A Strategy for Savings Banks," 12th Automation Conference, Amsterdam, 18-22 Mai 1987.

U.S. (please see table 5). The multiple solutions being explored were telephone use (Telephone Bill Pay, USA), television use (USA, West Germany, Prestel), computer use (USA and Belgium), and Minitel (France and USA), all of which had their pros and cons. The information networks being operated as public utilities opened up a new market sector supported by economies of scale in mass markets.[80]

In the decade prior to the advent of the Internet, retail banking pondered its role within the banking industry as pertaining to these developments. The collaborative processes and the accumulated know-how increased the variety of products and services available from the savings banks. The IPACRI (Italian Savings Banks Computer Center), for example, offered banks a franchise arrangement that gave them technological access to a multi-service OLRT system beginning in 1987. The so-called *Conto Reale* (Real Account) was the first provided service that included both home banking and cash management, focusing not only on the savings banks themselves but on their business clients in particular.[81] However, the Corporate Electronic Banking Services (CEBS) option was not widespread. German, Austrian, Swedish and Finnish banks considered the service only with a passing interest, as they already considered that "cash management did not offer as many advantages to the firm. It was only a little quicker than waiting for the daily statement and more convenient to consolidate accounts."[82] Similar reactions came from the British TSBs, as Jack M. Large, head of Financial Services Development of the TSB Group pcl, London and editor of *Cash Management News* warned:

> "What's new is best" is a silly and dangerous idea. Yet it dominates many banks' ideas on CEBS. The wrong use of CEBS can cost you millions and produce little or no benefit either in terms of new customers or extra revenue.

He therefore insisted on extrapolating the strategic knowledge the banks had of corporations' internal cash and treasury systems as well as the costs and realities of payment processing in corporations.[83]

Certainly, during the second half of the 1980s, the demand from payment services based upon plastic continued to grow thanks to smart cards, the international value added of the networks, and ATM expansion around the world. New product lines were

---

[80] Linda K. S. Moore, "What's Happened to Home Banking," 12th Automation Conference.
[81] F. Chiusa, "Automating Banking Services to Firms. A client point of view," 12th Automation Conference.
[82] ISBI, 29th Meeting of the BOAC, Rome, 8-9 March 1984 (BA-311).
[83] J. M. Large, "Delivery of Corporate Electronic Banking Services. The basic realities," 12th Automation Conference.

created to attract more customers (both household and business). Belonging to payment networks offered benefits, but it also implied a loss of identity for traditional retail banking. It was difficult for any bank to go it alone, thus the savings bank tradition played in their favor, despite the consequences of deregulation and strong competition.[84] As noted by B. Hedberg of Sweden, Vice President of Svenska Sparbanksförenigen, in the Tokyo conference of 1984: "The technology that is about to change the world –also the banking world– is a mix of computer hardware, communication systems, and decision support models".[85] In the years prior to the explosion of the Internet, IT not only affected how banks operated but also affected what services they offered and where these services were offered. IT was creating trends that would later become hegemonic while also determining which banking services were being offered.

Conclusion: diverging path to a networked world

This paper began by considering a dichotomy whose analysis could conclude – either specifically or non-specifically – with a dilemma. The dichotomy has been established by – and based upon – empirical observation, meaning that one can see divergent patterns in the process of introducing computers (using the worldwide savings bank industry as a reference). However, general considerations about the ICTs, especially beginning with the Second Globalization, lead in much of the literature to the end result that ours is a networked world, and we are therefore faced with convergent fault lines (the clearest indicator being the Internet, seen as a network of networks).

The savings bank industry constitutes a good field of analysis given the collaborative structures that exist at its core but that also facilitated the flow of information and the diffusion of innovation within the ICT field. Within such a fluid framework, it is much easier to detect the continuities and the changes and at which point divergence or convergence occurs within the patterns of technological diffusion.

The conclusions proceed in the following manner. On the one hand, the arguments presented based on observations of the different regional and national industry paths in the Western world allow us to explain the causes and reasons for these divergent trends.

---

[84] Simon Evans (Price Waterhouse), 12th International Automation Conference.
[85] B. Hedberg, "Computers & Communications Plus Organization Design Times Business Ideas. A Formula for Successful Banking," 11th International Automation Conference, Tokyo, 22-25 October 1984.

On the other hand, historical observation also shows how the foundations of this divergence must be situated within an idiosyncratic and not an asymmetric landscape. In this area, the perspective of technological diffusion versus technological adoption/appropriation (the end-user as an active participant) becomes particularly relevant. Consequently convergent phenomena of a general nature tend to occur over the long term. These phenomena configure the network structures that then define the Second Globalization. It is precisely for this reason that the era prior to the Internet has been examined here, to demonstrate how the formation of a networked world was configured within a relatively asymmetric context. The resulting conclusion obtained with regard to the proposed framework (ICT and the savings bank industry) suggests that the existence of divergent paths at specific moments did not enable the development of a networked world. Rather, this study concludes that various trends have contributed to the formation and to the integration of networked structures.

The on-line issue (batch processing) and the OLRT clearly manifest these varied pathways. The OLRT implementation process was very volatile; in some cases, the process was quick (especially in those countries where networks were established as public utilities), while in other cases, batch processing turned out to be more efficient and economical due to the available infrastructure in and the accumulated experience of the banks. The role the European public sector played, in the 70s and 80s, was very significant to the creation of telecommunication infrastructures that would later support Home Banking and Videotex (both of which emerged just prior to the privatization processes, which would end the natural monopolies of the telecommunications sector prior to the arrival of the Internet). The German, French and Spanish cases demonstrate these processes.

Shared networks such as ATMs and EFTPOS should have overcome, in the 70s and in the 80s, the multiple technical complications (in both hardware and software), administrative complications (the distribution of charges and fees) and market complications (collaboration versus competition). The global practice was to create mixed networks in which all manner of banking institutions would participate. In this sense, savings banks should have evolved to collaborate with commercial banks, clearing banks and other cooperative banks, expanding the collaborative tradition their own industry.

Bibliography

Abbate, Janet. "Building the ARPANET: Challenges and Strategies." In *Inventing the Internet*, 44-81. Cambridge, Mass: MIT Press, 1999.

Alberts, G. "Appropriating America: Americanization in the History of European Computing." *Annals of the History of Computing, IEEE* 32, no. 2 (2010): 4-7.

Balodis, Rihards and Inara Opmane. "History of Data Centre Development." In *Reflections on the History of Computing : Preserving Memories and Sharing Stories*, edited by Tatnall, Arthur. Heidelberg, Dordrecht, New York: Springer-Verlag, 2012.

Bátiz-Lazo, Bernardo, Tobias Karlsson, and Björn Thodenius. "The Origins of the Cashless Society: Cash Dispensers, Direct to Account Payments and the Development of on-Line Real-Time Networks, C. 1965-1985." *Esays in Economic & Business History* 32, (2014): 100-137.

Bátiz-Lazo, Bernardo and Peter Wardley. "Banking on Change: Information Systems and Technologies in UK High Street Banking 1919-69." *Financial History Review* 14, no. 2 (2007): 177-205.

Batiz-Lazo, Bernardo, Joan Carles Maixé Altés, and Paul Thomes. "In Digital we Trust: The Computerisation of Retail Finance in Western Europe and North America." In *Technological Innovation in Retail Finance: International Historical Perspectives*, edited by Batiz-Lazo, Bernardo, Joan Carles Maixé Altés and Paul Thomes, 3-12. New York, London: Routledge, 2011a.

———. *Technological Innovation in Retail Finance: International Historical Perspectives*. Routledge International Studies in Business History. Vol. 20. New York: Routledge, 2011b.

Batiz-Lazo, Bernardo and J. Carles Maixé-Altés. "Organizational Change and the Computerization of British and Spanish Savings Banks, Circa 1950–1985." In , edited by Batiz-Lazo, Bernardo, Joan Carles Maixé Altés and Paul Thomes. Vol. 20, 137-154. New York, London: Routledge, 2011.

Batiz-Lazo, Bernardo and J. Carles Maixe-Altes. "Managing Technological Change by Committee: Adoption of Computers in Spanish and British Savings Banks (Circa 1960-1988)." *Revista De Historia Industrial* no. 47 (2011): 117-150.

Bell, William D. "The 'DUZ' General-Purpose Control Panel for the IBM Type 604 Electronic Calculator." *IBM Technical Newsletter* 1, no. June (1950): 9-11.

Bonin, Hubert. "From Prehistory to the History of Computer in Banking: Mecanization of Data Processing and Accounting Methods in French Banks, Circa 1930-1950." In *Technological Innovation in Retail Finance: International Historical Perspectives*, edited by Batiz-Lazo, Bernardo, Joan Carles Maixé Altés and Paul Thomes, 15-36. New York, London: Routledge, 2011.

Booth, Alan. *The Management of Technical Change : Automation in the UK and USA since 1950*. Basingstoke: Palgrave Macmillan, 2007.

Ceruzzi, Paul E. "The Internet before Commercialization." In *The Internet and American Business*, edited by Aspray, W. and Paul E. Ceruzzi, 9-43. Cambridge, Mass. ; London: MIT, 2008.

Chiusa, F. "Automating Banking Services to Firms. A Client Point of View.".

Cortada, James W. "Researching the History of Software from the 1960s." *IEEE Annals of the History of Computing* 24, no. 1 (2002): 72-79.

Cortada, J. W. "Looking at Technology through Industry Eyes." *Annals of the History of Computing, IEEE* 28, no. 2 (2006): 88-88.

———. "Patterns and Practices in how Information Technology Spread Around the World." *Annals of the History of Computing, IEEE* 30, no. 4 (2008): 4-25.

———. "Studying the Role of IT in the Evolution of American Business Practices: A Way Forward." *Annals of the History of Computing, IEEE* 29, no. 4 (2007): 28-39.

Cortada, James W. *The Digital Flood : The Diffusion of Information Technology Across the U.S., Europe, and Asia*. New York ; Oxford: Oxford University Press, 2012.

———. "How did Computing Go Global? the Need for an Answer and a Research Agenda." *Annals of the History of Computing, IEEE* 26, no. 1 (2004): 53-58.

Eglash, Ron, Jennifer L. Croissant, Giovanna di Chiro, and Ray Von Fouche, eds. *Appropriating Technology: Vernacular Science and Social Power*. Minneapolis: University of Minnesota Press, 2004.

Evans, Simon (Price Waterhouse). "12th International Automation Conference." (1987).

Gall, Alexander. "Atlantropa. A Technological Vision of a United Europe." In , edited by van der Vleuten, Erik and Arne Kaijser, 99-127. Sagamore Beach, MA: Science History Publications/USA, 2006.

Gener, J. "International ATM Cooperation, Posibilities for Savings Banks."Amsterdam.

Haigh, Thomas. ""A Veritable Bucket of Facts" Origins of the Data Base Management System." *ACM SIGMOD Record* 35, no. 2 (2006): 33-49.

Hård, Mikael. "Technology as Practice - Local and Global Closure Processes in Diesel-Engine Design." *Social Studies of Science* 24, no. 3 (AUG 1994, 1994): 549-585.

Hård, Mikael and Andrew Jamison. "Conceptual Framework: Technology Debates as Appropriation Processes." In *The Intellectual Appropriation of Technology: Discourses on Modernity, 1900-1939*, edited by Hård, Mikael and Andrew Jamison, 4-15. Cambridge, Mass.: MIT Press, 1998.

Harper, Tom and Bernardo Bátiz-Lazo. *Cash Box :The Invention and Globalization of the ATM*. Louisville: Networld Media Group, 2013.

Hedberg, B. "Computers & Communications Plus Organization Design Times Business Ideas. A Formula for Successful Banking,".

Heide, Lars. *Punched-Card Systems and the Early Information Explosion, 1880-1945*. Studies in Industry and Society. Baltimore: Johns Hopkins University Press, 2009.

Infante, Jorge. "El Desarrollo De La Red Pública De Datos En España(1971-1991): Un Caso De Avance Tecnológico En Condiciones Adversas." *BIT Digital* 136, (Noviembre, 2002): 1-20.

ISBI. "29th Meeting of the Business Organization and Automation Committee.".

———. "General Report and Working Programme."Geneve.

———. "How to Run a Data Centre Efficiently - Batch Operations.".

———. "Minutes of the 17th Meeting of the Business Organization and Automation Committee." Stockholm, May 10-11, 1978, 1978.

———. "Minutes of the 26th Meeting of the Business Organization and Automation Committee.".

———. "Minutes of the 33th Meeting of Business Organization and Automation Committee, Rome, 2-3- April 1986.".

———. "Minutes of the 34th Meeting of the Business Organization and Automation Committee.".

———. "Standarization in Banking, Bank Telecommunication Messages [TC68/SC5]: Part 1 Funds Transfers Messages." *(DP 7882/1, Geneve, 16-03-1983)* (1983b).

Körberg, Ingvar. *Förnyelsen: Sparbankernas Historia 1945-1980*. Stockholm: Ekerlid, 2006.

Laborie, Leonard. "A Missing Link? Telecomunication Networks and European Integration 1945-1970." In *Networking Europe: Transnational Infrastructures and the Shaping of Europe, 1850-2000*, edited by van der Vleuten, Erik and Arne Kaijser, 187-215. Sagamore Beach, MA: Science History Publications/USA, 2006.

Lamoreaux, N. R., D. M. G. Raff, and P. Temin. "Against Whig History." *Enterprise & Society* 5, no. 3 (2004): 376-387.

Lamoreaux, Naomi R. and Daniel M. G. Raff. *Coordination and Information: Historical Perspectives on the Organization of Enterprise*. A National Bureau of Economic Research Conference Report. Chicago: University of Chicago Press, 1995.

Langlois, Richard N. *The Dynamics of Industrial Capitalism: Schumpeter, Chandler, and the New Economy*. The Graz Schumpeter Lectures. London ; New York: Routledge, 2007.

Large, J. M. "Delivery of Corporate Electronic Banking Services. the Basic Realities." *12th Automation Conference, Mai 18-22, 1987, Amsterdam, 1987* (1987).

Larsen, P. E. "EDP Cooperation between Nordic Countries.".

López García, Santiago M. "The Role of Telefónica:The Internationalization of Telecommunications in Spain, 1970-2000." *Business and Economic History on Line* 1, (2003).

Maixé-Altés, J. Carles. *Innovación Y Compromiso Social. 60 Años De Informatización Y Crecimiento, 1950-2011*. Barcelona: Caixa d'Estalvis i Pensions de Barcelona - Edicions 62, 2012.

———. "La Opción Tecnológica De Las Cajas De Ahorro Españolas Antes De Internet, Circa 1950-1995." *Investigaciones De Historia Económica - Economic History Research* 9, no. 2 (2013): 175-186.

Martín Bernal, Oscar and M. Rodríguez Jiménez. *25 Años De Transmisión De Datos*. Madrid: Telefónica Transmisión de Datos, SA, 1998.

Martin, I. "Too Far Ahead of its Time: Barclays, Burroughs, and Real-Time Banking." *Annals of the History of Computing, IEEE* 34, no. 2 (2012): 5-19.

Martin, Ian. "Britain's First Computer Centre for Banking: What did this Building do?" In , edited by Batiz-Lazo, Bernardo, Joan Carles Maixé Altés and Paul Thomes, 37-70. New York, London: Routledge, 2011.

Martin, R. and D. Turner. "Demutualization and the Remapping of Financial Landscapes." *Transactions of the Institute of British Geographers* 25, no. 2 (2000): 221-241.

Martínez Miguez, Luis. "La Transmisión De Datos En España." *Boletin De Ingenieros De Telecomunicación (Telecommunications Engineers Bulletin)* 38, (1985): 45-54.

McGrill, J. "Electronic Funds Transfers for Individual Payments Transfers within the German Savings Banks' Giro Network." , *ISBI, 10 April 1978 (BA-181)* (1978).

Misa, T. J. "Understanding 'how Computing has Changed the World'." *Annals of the History of Computing, IEEE* 29, no. 4 (2007): 52-63.

Misa, Thomas J. and Johan Schot. "Inventing Europe: Technology and the Hidden Integration of Europe." *History and Technology* 21, no. 1 (2005): 1-19.

Mohren, J. "Service Or Self-Service in Banking: A Strategy for Savings Banks.".

Moore, Linda K. S. "What's Happened to Home Banking."AMsterdam.

Nevans, Simon (Price Waterhouse). "12th International Automation Conference." (1987).

Nolan, Mary. *Visions of Modernity: American Business and the Modernization of Germany*. New York: Oxford University Press, 1994.

Petrusky, J. W. "Further Trends in Information Technology. Fourth Generation Hardware. how Will these Changes Affect Bank Automation?".

Reistad Research Report. *Payment Systems Perspective no. 1. Preauthorized Payroll Deposits*. New York: Payment System Incorporated, March, 1971.

Revell, Jack. *The Future of Savings Banks. A Study of Spain and the Rest of Europe*. Research Papers in Banking and Finance. Bangor: Institute of European Finance, University College of North Wales, 1989.

Rogers, Everett M. *Diffusion of Innovations*. 5th ed. New York: Free Press, 2003.

Scott, Susan V. and Markos Zachariadis. *The Society for Worldwide Interbank Financial Telecommunication (SWIFT): Cooperative Governance for Network Innovation, Standards, and Community*. Routledge Global Institutions Series. Vol. 83. London ; New York, NY: Routledge, Taylor & Francis Group, 2013.

Sylla, R. "Financial Systems and Economic Modernization." *Journal of Economic History* 62, no. 2 (2002): 277-292.

Thomes, Paul. "Is there an ICT Path in the German Savings Banking Industry? Circa 1900–1970s." In *Technological Innovation in Retail Finance: International Historical Perspectives*, edited by Batiz-Lazo, Bernardo, Joan Carles Maixé Altés and Paul Thomes. Vol. 20, 119-136. New York, London: Routledge, 2011.

Van der Vleuten, Erik and Arne Kaijser. "Prologue and Introduction. Transnatinal Networks and the Shaping of Contemporary Europe." In *Networking Europe. Transnational Infraestructures and the Shaping of Europe, 1850-2000*, edited by van der Vleuten, Erik and Arne Kaijser, 1-22. Sagamore Beach, MA: Science History Publication/USA, 2006.

Wadhwani, R. Daniel. "Organisational Form and Industry Emergence: Nonprofit and Mutual Firms in the Development of the US Personal Finance Industry." *Business History* 53, no. 7 (2011): 1152-1177.

Wardley, Peter. "The Commercial Banking Industry and its Part in the Emergence of the Corporate Economy in Britain before 1940." *Journal of Industrial History* 3, (2000): 71-97.

Wild, R. "Report about Terminals," 5th Conference on Automation, ISBI, Vienna, 1971.

Yates, JoAnne. *Structuring the Information Age : Life Insurance and Technology in the Twentieth Century*. Baltimore, Md. ; London: Johns Hopkins University Press, 2005.

Table 1

Savings Banks Associations and Central Savings Banks in Europe

Country	*Entity*	*Headquarters*	*Established*	*Status*
Austria	Reichsverband Deutscher Sparkassen in Österreich" (Imperial Association of German Savings Banks in Austria)	Vienna	1905	Savings banks association
	Hauptverband der österreichischen Sparkassen (Federal Association of Austrian Savings Banks)	Vienna	1923	Savings banks association
	Girozentrale und Bank der österreichischen Sparkassen AG	Vienna	1938	Central savings banks
Denmark	Fællesbanken	Copenhagen	1919	Central savings banks
	Danmarks Sparekasseforeningen	Copenhagen	1947	Savings banks association
Finland	Suomen Säästopankkiliitto	Helsinki	1823	Savings banks association
	Skopbank	Helsinki	1908	Central savings banks
France	Caisse de Dêpot et Consignations	Paris	1816	Central savings banks
Germany (F.R.)	Deutscher Sparkassen - und Giroverband e.V. (DSGV)	Bonn	1924	Savings banks association
	Landesbanken (12 *Länder Banks)*	Frankfurt et al.	1948	Central savings banks
Italy	Associazione fra le Casse di Risparmio Italiane (ACRI)	Roma	1911	Savings banks association
	Istituto di Credito delle Casse di Risparmio Italiane (ICCRI)	Roma	1921	Central savings banks
Nedetherlands	Nederlandse Spaarbankbond	Amsterdam	1907	Savings banks association
	Bank der Bondsspaarbanken (BdB Bank)	Amsterdam	1971	Central savings banks
	International Savings Banks Institute (ISBI)	Amsterdam	1924	World savings banks association
Nordic countries	Nordic Central Savings Bank Association Delegation (NCSD)	Copenhagen Helsinki Oslo Stockholm	1931	Regional central savings Banks association
Norway	Sparebankforeningen i Norge	Oslo	1914	Savings banks association
	Union Bank (ABC Bank)	Oslo	1919	Central savings banks
Spain	Confederación Española de Cajas de Ahorro (CECA)	Madrid	1928	Savings banks association
	Instituto de Crédito de las Cajas de Ahorro Españolas (ICCA)	Madrid	1933-1971	Central savings banks
Sweden	Svenska Sparbanksföreningen	Stockholm	1900	Savings banks association
	Swedbank	Stockholm	1942	Central savings banks
UK	Trustee Savings Banks Association	London	1887	Savings banks association

Source: ISBI. Automation in Savings Banks. Situation report at the beginnning of 1969. Results of an Investigation (Amsterdam: International Savings Banks Institute, 1969 (mimeo). ISBI, International Savings Bank Directory, Amsterdam: International Savings Banks Institute,1987 and author.

Table 2

An approach to European Savings Banks Business and Tecnology in 1957

	Caisse d'Épargne de la République et Canton de Genève (Switzerland)	*Caisse d'Épargne de Lyon (France)*	*Cassa de Risparmio delle Provincie Lombarde, CARIPLO (Italy)*	*Caja de Pensiones para la Vejez y de Ahorros, CPVA (Spain)*
Year of fundation	1816	1822	1823	1904
Acount holders	122 138	487 188	2 506 198	1 902 276
Annual operations	191 626	700 000	10 710 947	4 544 625
Deposits (US $)	54 185 715	130 770 086	522 035 334	205 381 633
Offices	-	65	241	216
Business diversification	Saving accounts (notice and limited amount)	Saving accounts	Saving accounts	Sight and time deposits
		Cheque transfers	Time deposits	Pension funds
	Securities safekeeping	Giro post	Professional accounts	Personal loans
	Morgage loans	Coupons (securities)	Loans, Discount,	Morgage loans
	Loans for commercials banks		Morgage loans	Securities services
				Pawnbroker
Tecnology	Punched-Cards Systems	Punched-Cards Systems	Punched-Cards Systems	Electromecanical devices:
	and vacuum tubes (CPC)*	BULL (from 1951)	and vacuum tubes (CPC)*	Rheinmetal, MADAS,
	IBM (from 1957)		IBM (from 1948)	Burroughs and National

Sources: AHC, Report to the Board of Directors about the visit to Europe by the commissioners of the Board, 7 january 1959, and author.

* CPC: Card-Programmer Calculator

Table 3

European and US Savings Banks with their own Electronic Data Processing Systems (ordered in percentage of savings banks number) at the beginning of 1969

	Total number of entities in each country	*Entities with own EDP systems*	*% of all Savings Banks*	*% of all Savings Banks deposits accounts*	*% of all Savings Banks transactions*	*Online systems (teleprocesing)*		
						Number of Savings Banks	*Offices with teleprocesing*	*Number of accounts*
Italy	89	48	53.9	89.4	NA	2	227	1 109 496
Spain	86	30	34.8	29.0	NA	8	37	1 557 056
Germany	861	210	24.4	NA	NA	3	158	1 807 300
United States	493	115	23.3	NA	NA	31	NA	NA
Austria	170	4	2.3	48.5	42.0	3	66	2 209 461
Netherlands	201	4	2.0	35.0	30.0	1	45	536 000
UK	77	1	1.3	6.2	7.9	0	-	-
Sweden	325	2	0.6	3.0	3.0	1	12	120 000
Denmark	384	2	0.5	22.5	32.5	1	61	600 000
Finland	346	1	0.3	3.0	2.2	0	-	-
Norway	518	0	0.0	-	-	0	-	-

Source: International Savings Banks Institute. Automation in Savings Banks. Situation report at the beginning of 1969. Results of an Investigation. ISBI, Amsterdam, 1969. (mimeo). Ibidem Appendix Report of Spain.
Note: including the inminent start up of new computers at the beginning of 1969.

Table 4

Savings Banks Data Centre Companies at 1969 in Europe

	Company	*Legal entity*	*Data Centres*	*Participating Savings Banks*				*Financing*
				Number	*%*	*% deposits accounts*	*% transactions*	
Austria	Sparkassen-Datendienst (SPARDAT), Gesellschaft m.b.H.	Limited Co.	Linz (Graz and Innsbruck were operative in 1970)	NA	NA	NA	NA	Capital shares - Central Bank Association
Denmark	Sparekassernes Data centraler	Cooperative Society	Copenhagen, Aarhus, Odense	112	29.2	45.4	52.5	Loans of the participating banks
Finland	Department of Säästöpankkien Keskus-Osake-Pankki	Savings Banks Central Bank	Helsinki	38	11.0	17.1	23.6	Savings Banks Central Bank
Germany (F.R.)	Buchungszentrale der Westf.- Lippischen Sparkassen GmbH	Limited Co.	Münster (Wesfalia)	360	41.8	NA	NA	Capital shares
	Data Centres (59)	Cooperative, Ltd Co. and S.B. Central Bank	Diverse cities					According to every legal entity
UK	MANCAP, West Midland, Scotland, SPOT, Eight Bank Group (Data Centres in their initial stages)	No formal*	Manchester, Shrewsbury, Glasgow, Rawley (Sussex) and Southport	20**	27.3	25.2	28.3	MADCAP and WEST MIDLANDS: loans from the Treasury. SCOTLAND: contribution by participating TSB
Spain	CECA Computer Centre	Savings Banks Central Bank	Madrid	1	-	-	-	Savings banks and industry association
Nedetherlands	Coöp. Administratie Centrale voor Spaarbanken (CAS)	Cooperative	Amsterdam	55	26.5	40.0	50.0	Loans of the participating banks
Norway	Fellesdata A/S	Joint stock Co.	Oslo	33	6.4	-	25.0	200 shareholders and Central Bank
Sweden	Sparbankernas Datacentrales AB (SPADAB)	Joint stock Co.	Stockholm, Göteborg, Malmö and Linköping	140	43.0	87.0	-	Small share capital and loans of paticipating banks

Source: International Savings Banks Institute. Automation in Savings Banks. Situation report at the beginnning of 1969. Results of an Investigation. ISBI, Amsterdam, 1969 (mimeo) and author.

* The largest bank in the group acts as contractor, and the other banks have agreements with the main bank

** Excluding EIGHT BANK GROUP

Table 5

Payment and Clearing System Services in Savings Banks betwen 1980 and 1985

Country	*Savings banks clearing-house systems*	*Savings banks networks*	*New projects*	*Other financial institutions iniciatives*
Austria	SPARDAT System (batch and on-line processes)	Cash Dispenser Pool (big banks and savings banks)		
Belgium	CEC-UCV Centre for Exchange and Clearing (all banking system, including Postal Giro System and Central Bank) from 1974	Cash dispenser Joint Network (with big commercial banks)	POS as a consecuence of cash dispenser developments (Payment Terminal Outdoor). BANCONTACT ATM's network (branches, petrol stations, supermarkets)	Investment Trust (banks and savings banks). Compatibility between BANCONTAC and MISTER CASH networks. New frontiers of collaboration/competition
Denmark	PI - net: clearing nertwork (banks and savings banks) from 1987 batch solutions	DANKORT (banks and SB card: ATM and POS) Joint Company PKK. VIDEOTEX (1986)	Printer telephone terminals project and Audio response project (business and private costumers). PCs at branches	Paperless Bonds Danish Stockmarket (Vaerdipapircentralen)
Germany (F.R.)	Savings Banks Time-Sharing System (STS) and EZU, via Girocentralen - from 1978	Cash Dispenser Pool. Computer-based services using BTX network	Eurocheque cards. PCs at branches	Bildschirmtext, BTX (Videotext) - Deutsche Bundespot (German Postal Service)
Finland	Public Data Process Network. From 1986 Skopbank (a new clearing network)	3 networks: Skopbank, two savings banks, and cooperative banks	OLRT services to business clients (Skopbank system) and introduction of IBM sofware (IMS Fastpath). CAT: new ATM made in Finland	
France	Système Interbancaire de Telecompensation, SIT (big banks) from 1986	Cheque guarantee card. French Post Office: TELETEL (MINITEL terminal: home banking and telepayment). Carte Bancaire: access to national card system (ATM and POS)		Carte Bleue VISA (CB) and Chip-Card developments. New platform (national card payments): STERIA-THOMSON (end 1980s)
Italy	SIBI (IPACRI) and SIA (Italian Banks' Automation Co.)	CARISMAT (ATM network) and BANCOMAT (joint network)	Firts desingn of POS and Home Banking (IPACRI support). Multi services: LINEA APERTA System (IPACRI) from 1987	VIDEOTEX (the Italian public system of videotext). BANCOMAT (ATM national network). National Bank-Card

Japan	Local Banks Data telecommunication System, LBDTS (from July 1968). Data Telecommunication System of all Banks (from 1973). Japanese Postal Savings Banks Service (on-line from 1978)	Post Savings Bank network (Cash dispenser and ATM). Integrated Services Digital Network - ISDN (voice, video and data).	The Bank of Tokio global network (TOHNET): packet switching network (from 1979).	Banking system in transition to advanced information society. New TOHNET network (ISDN) from 1986 and Shared ATM network (Banks and Savings banks) from 1988
Netherlands	Spaarbanken Real Time Interactief Systeem (SPRINT) - Woerden Computer Centre (CB)	Savings banks were connected to Automated network of TELEGIRO'S (from 1985)	Shared network of savings banks computers: S-network	Discussion about fees in shared networks of ATM and EFTPOS (between savings banks and other banks). Philips POS terminal
Norway		BANKKORT (cards, with banks). MiniBank System (cash dispenser, POS terminals in petrol stations)		
Spain	SICA (from 1976)	Red 6000 (cards and ATM). Motorway POS Network (ACESA). ATM with passbook facilities	Gyro System and national clearing (all banking institutions): magnetic tapes and SICA. Expansion of POS	4B Network and Servired (ATM and EFTPOS)
Sweden	Savings Banks Giro	MINIBANK (from 1978). Savings Banks Consortium (Central capital markets). The Nordisk Spardata Cash Dispenser Project (nordic countries)	New generation teller terminals: Ericsson System 2100. OLRT: TOBA RT. New Savings Banks' System for Payment (SUS), 1986	Backup Centralen AB (commercial banks). Society's Integrated Payment Systems On-line (SIBOL)
UK	TSB Group Project: to connect data processing centres	Agreement with Barclays and Bank of Scotland (use of ATM), and Clearing banks (cheque guarantee card facility from outside of UK and future POS service). TRUSTCARD (VISA)	Viewdata: Prestel System (30 branch offices)	POS System: UK banks and card companies. LINK (the UK ATM network) from 1986

Sources: Author from ISBI, Minutes of Working Groups and Meetings of BOAC, 1970-1990.