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## **MANAGING TECHNOLOGICAL CHANGE BY COMMITTEE: ADOPTION OF COMPUTERS IN SPANISH AND BRITISH SAVINGS BANKS (circa 1960-1988)**

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**MANAGING TECHNOLOGICAL CHANGE BY COMMITTEE:  
ADOPTION OF COMPUTERS IN SPANISH AND BRITISH  
SAVINGS BANKS (circa 1960-1988)**

**Abstract** - This article explores how savings banks managed the process of computerization through *ad hoc* management committees articulated under the aegis of national associations (with an emphasis on developments in Spain). The combination of cash payments (and low penetration of cheques) in the Spanish retail sector together with increasing administrative costs, acted as incentives for Spanish savings banks embracing applications of computer technology (and specifically data processing infrastructure) to articulate viable solutions for cost reductions, offer alternative payment systems to cash and facilitate greater diversification of their business portfolio within retail banking. A running comparison is made with similar developments in Britain. Computerization committees had little impact amongst the trustee savings banks. This responded to a combination of a poor corporate strategy and a number of external events (including regulatory constraints limiting their business portfolio as well as amalgamation into a single entity). By the mid-1970s it was evident that the trustee savings banks had lost a significant share of the total deposits in sterling made by UK residents. Meanwhile, collective investments in computer technology were instrumental for Spanish savings banks to successfully contest the domestic retail bank market.

**Resumen** – En este trabajo documentamos el papel que dentro de las asociaciones industriales jugaron las comisiones de automatización en los procesos de informatización de los intermediarios financieros minoristas. La investigación se centra en las cajas de ahorro españolas, estableciendo una comparación con las británicas para identificar aspectos idiosincráticos de las primeras. El elevado uso de efectivo, combinado con la poca penetración del cheque en el sistema de pagos y los incrementos de los costes administrativos fueron un incentivo para que las cajas de ahorro españolas articularan políticas y soluciones conjuntas. Del mismo modo que, en su momento, estas prácticas facilitaron la diversificación de su cartera de inversiones y les permitieron competir con éxito en segmentos del mercado bancario tradicionalmente dominados por la banca comercial. Mientras tanto, las cajas británicas tuvieron poco éxito, tanto en la coordinación de sus políticas como en la conquista del mercado.

**Key words:** co-ordination vs. hierarchies, management committees, collaboration, networks, technical change, computers, savings banks (TSB, cajas), national associations of saving banks (CECA), Spain, UK.

## 1 Introduction

Industry associations have been found to be important in promoting the use of mechanical, electromechanical and computer technology (Cortada 2008a; Cortada 2008b, 5). Industry associations are important organizations in the process of diffusion, that is, ‘the process in which an innovation is communicated through certain channels over time among members of a social system.’ (Rogers 2003, 474). As an alternative to the functional hierarchy, industry associations can be understood as an innovation network as these can offer communities of practice (i.e. individuals with similar skills and interests) a forum to share experiences and encourage the evolution of technology. Research in this article documents how, as was the case of the insurance industry documented in Yates (2005, 77ff), industry association provided European retail financial intermediaries a space to explore, respond, interact and sometimes even shape computer and telecommunications technologies.

In his influential book Sloan (1963) notes the advantages of another form of collaboration to design and implement general policy in the manufacturing of trucks and automobiles, namely *ad hoc* management committees. In this article we explore the role of *ad hoc* committees organised within the auspices of savings bank associations. Attention to *ad hoc* committees helps to explore the process of innovation inside and outside the boundary of the firm. At the same time, attention to savings banks illustrates an organizational form with different corporate governance to limited liability banks and public listed companies, namely not-for-profit financial institutions. Studying not-for-profit, co-operative and mutual financial organisations is important not only because they are often overlooked but because many of these forms populated European bank markets during the nineteenth and twentieth century’s. Their activities were critical to the transformation of low value, high volume deposits into loanable funds for households, firms and governments.

In Europe, most savings banks established industry associations. These included those in UK (1887), Sweden (1900), Italy (1911) and France (circa 1960). In the same way that the United States Building and Loan League (established in 1893), most of the

European associations aimed to elevate the public image of their member organisation (that is, savings banks and savings and loans), finding ways to bring more people to the thrift movement, and extolled virtues of saving and of home ownership.<sup>1</sup> In this article we document how in ‘supporting the deployment of specific industry-centric applications, training and publicity of new technology’ (Cortada 2008b, 5), industry associations were key for the adoption of computer applications by Spanish and British saving banks.

Initially there was little opportunity or indeed incentives for collaboration during the early stages of development of savings banks in the United Kingdom and Spain. However, Sprague (1977) noted that the advent of computer related innovations resulted in co-operation among depositary institutions and even co-operation between government and private financial industry in both sides of the Atlantic. For him ‘[t]he world wide (sic) pattern that has emerged is competition between cooperating groups of depositary institutions.’ (p. 29). Savings banks in the United Kingdom and Spain offered the opportunity to compare and contrast how the same organisational form managed the process of technological change during the second half of the twentieth century while gaining critical scale through collaboration. Moreover, our research provides details on the extent to which ‘... beneath the surface of the talk about cooperation in Europe [there was] a very strong competitive pattern...’(idem).

Research in this article starts by considering the creation of the first automation committees formed by British and Spanish savings banks. These emerged as savings banks embraced first and second generation computer technology. The research ends around 1988, when a number of regulatory changes took place in both Britain and Spain. In the UK, savings banks were amalgamated into a single institution and floated in the stock exchange in 1986. Regulatory changes brought the savings banks in direct competition with other established participants in British retail finance (such as clearing banks and building societies). In Spain, the year 1988 marked the introduction of new regulation, which removed geographic restrictions to the growth of savings bank retail branches while allowing these networks to expand throughout the whole country. As had been the case in Britain, Spanish authorities aimed that changes in regulation would increase competitive intensity in retail financial markets.

We considered that there were two well established yet alternative approaches for the analysis of the formation and longevity of co-operation and business to business

interaction, namely transaction cost economics (e.g. Williamson 1989) and the economics of industrial networks (e.g. Economides 1996). It was deemed that either would help assessing the nature and development of innovation networks built around *ad hoc* committees of savings banks. However, network economics offered considerable advantages when analyzing the phenomenon of technological collaboration between firms: while transaction cost economies are based upon market oriented activities and competition within a vertical hierarchical framework based on contracts (Coase 1937), network economics focus on non-hierarchical cooperation based on confidence (Christensen et al. 1990, 27; Karlsson and Westin 1994, 1-6; Rogers 2003). Another apparent advantage of network economics was their conceptualisation of innovation as a result of the long term nature of co-operative relations, whilst transaction costs are characterised by the non-permanent nature of transactions (Karlsson and Westin 1994, 3). Network economics, therefore, conceive systems of innovation to be an intermediate stage of organization, somewhere between the market and a hierarchy. Moreover, this framework has been successfully applied to innovations in financial services (e.g. Saloner and Shepard 1995; McAndrews 1997; Shy and Tarkka 2002).

In light of the above, it seemed that network economics provided a superior alternative to transaction costs as reference to frame the analysis of collaboration among savings banks in Spain and the UK. It was deemed appropriate given the long-term and well defined nature of British and Spanish savings bank associations (and some of their *ad hoc* committees). This feature contrasted starkly with other views of innovation networks, which are generally considered to be based on agreements that are somewhat less than robust but successful only if they can last several decades (Powell 1990). Conceiving co-operation between savings banks as a response to technological change required adopting a holistic perspective which combined both economic and other social consequences of computerisation. Hence the framework of network economics was highly compatible with the historical approach used in this article while providing valuable insights when assessing the emergence of processes of technological collaboration by Spanish and British savings banks.

The remainder of this article structures as follows, section two summarises the origins and growth in the business portfolio of savings banks in Spain and the UK. Section three details the role of *ad hoc* committees in the computerisation of British savings banks. Section four considers the computerisation of Spanish savings banks

where a large number of initiatives took place through the mediation of their industry association. Conclusions are then presented in the fifth section.

## **2 Similarities and contrasts of Spanish *Cajas* and British TSB**

### **2.1 Common origins**

Savings banks in United Kingdom and Spain originated as retail finance organizations operating through democratic and philanthropic guidelines. With no share capital traded on the stock market, all their profits were either reinvested or in the case of Spanish banks, returned to the community through social spending. Savings banks sought to create thrifty habits amongst small and medium-sized savers like craftsmen, house servants or the growing proletariat, that is, outside commercial banks' target market (Horne 1947; Fishlow 1961; Titos Martínez 1989; Martínez Soto 2000).

The first savings bank was established in Ruthwell, Scotland in 1810 (Horne 1947, 34). Savings banks then grew throughout the UK and continental Europe. This often as a response of the middle classes to self-help institutions of the proletariat set up along Rochdale co-operative principles (Ross 2002). In Spain savings banks were introduced in 1835, some 25 years after the first savings bank began operations in Scotland, but their number remained low until regulatory reforms of 1874 and 1880. At the end of nineteenth century there were 231 savings banks in UK and 50 in Spain (Horne 1947, 388; MCM, 1900).

### **2.2 Product market diversification**

To create trust among potential depositors, the Savings Bank (England) Act 1817 required all such institutions to deposit their accumulated funds with the Commissioners for the Reduction of the National Debt, who held an account at the Bank of England (thus providing cast-iron security) for this purpose (Horne, 1947: 72). The same principles were extended to Scottish savings banks in 1835. Guarantees to depositors introduced by Act of 1817 were reinstated in subsequent legislation (enacted in 1833, 1863 and 1891) (Payne 1967).

Regulatory changes, therefore, limited the potential diversification of the British savings banks' investment portfolio and foreclose opportunities for direct lending to retail customers while their business remained in collecting low volume deposits. Funds

and operation of the savings banks would be under control of voluntary managers or trustees (hence the roots of the TSB acronym), none of whom was to derive any benefit from that office (Maixé-Altés 2009b).

All the features of the rather restrictive business policies in Britain were in stark contrast with the rather liberal regime at the Spanish savings banks. The initial business model of independent non-profit-oriented institutions with independent financial resources was very weak and made the creation of independent savings banks unviable. In 1839 the government of Martínez de la Rosa introduced reforms to use deposits at the savings banks as working capital to support the loans of the *monte de piedad*. The latter dated to the early modern period in Spain. Prior to amalgamation with the savings banks, the *monte de piedad* loaned money against collateral (usually jewellery or clothes) and they were effectively run as charity-oriented pawn brokers (Anton Ramirez 1876, iv; Martínez Soto 2003).

Legislation introduced in 1880, opened the way for the growth of Spanish savings banks as lack of a detailed regulation regarding their investment policies resulted in product diversification and growth of assets at a greater rate than savings banks elsewhere in Europe (Maixé-Altés forthcoming). The number of entities also grew substantially, that is, from 26 savings banks in 1880 to 66 in 1905. At the same time, the sum of deposit increased from 12 per cent of total deposits in Spain in 1880 to 16 percent in 1905 (MCM 1880, 1905; Tortella 1974; Martín Aceña 1985).

Meanwhile in the UK, together the trustees savings banks (TSB) would rank in size with any of the four main London clearing banks. In practice, however, there was little competition between clearing banks and savings banks or even amongst the savings banks. This as each individual TSB served a separate geographic area and competition for retail deposits became more acute until after the end of the Second World War. A similar development took place in Spain, where individual savings banks limited their activities to specific geographies. Initially because of lack of organisational capabilities and later, because of administrative restrains and legislation passed on during the Franco regime - until these restrains were gradually dissolved from 1977 onwards as part of the so called the 'Fuentes Quintana' economic reform (Grifell-Tatjé and Lovell 1996; Bátiz-Lazo 2004). By the 1962 Spanish savings banks had 27.5 percent of all deposits in Spain (BEBE, 1962). Meanwhile the TSB had a 9.2 percent of sterling deposits by UK residents (CLCB, 1978, p. 56).

Both Spanish and British savings banks saw the advent of business applications of computer technology with interest but neither were early adopters (Bátiz-Lazo and Maixé-Altés 2009). It was through collaboration that they decided to tackle the technological challenge posed by computers. Both British and Spanish savings banks were active in international associations and forums. This is a very important part of their story and how they responded to technological change. The history of international collaboration of European savings banks has not yet been documented in detail. However, in what follows we compare and contrast developments within domestic economies to highlight how idiosyncratic events led to the success and failure of co-operation. On the one hand, the TSB were responding primarily to domestic events (i.e. decimalization of sterling and amalgamation into a single entity) whereas Spanish savings banks were initially inspired by developments elsewhere in Europe. For instance, during the annual international meetings of savings banks associations, development around the application technology by Swedish savings banks were often seen as pioneering. Interestingly co-operation was more intense and longer lived in Spain than in the UK.

### **3 Computer activities and a detached industry association in Britain**

#### **3.1 Outsourcing to a central provider of services**

Growing recognition as to the commonality in their social orientation (and evangelical nature as portrayed by the self-referring label of ‘movement’) led 26 of the 389 trustee savings banks to come together and establish the Association of Savings Banks in Manchester in 1887 (Moss and Slaven 1992, 67). This initiative anticipated by about half a century the establishment of a similar organisation in Spain in 1928.

As was the case in Spain where the association had a very small staff (four or five full-time members of staff) until the 1950s, the British association was run ‘on a shoe string’. The work of the British association was to be directed by a Council of Management comprising representatives from not fewer than 14 of the larger banks; the day-to-day affairs were to be guided by a trio of honorary secretaries made up of the actuaries of the Glasgow, Manchester and Liverpool savings banks. The new Association was a modest but important step in self-regulation although it remained ineffective in persuading hundreds of small savings banks to speak and act as a single body at least until 1914 (Horne 1947, 324). Spencer (later Sir Spencer) Portal was

credited with introducing the idea of appointing a permanent secretary and a large Council in 1914 with the aim of deciding a common policy as well as a single voice to conduct negotiations with the government and promote legislation (Horne 1947, 325). Portal became deputy chairman of the Association in 1919, chairman in 1923 and president when relinquishing his chair in 1935. By the 1930s the Association under Spencer Portal was already successful in putting forward a common view to Parliamentary Committees and the Treasury to support the progress of the savings banks (Horne 1947, 326). This was important given the detailed regulatory framework surrounding the operation of the savings banks (see further Bátiz-Lazo and Maixé-Altés 2009).

However and in sharp contrast to the Spanish association, the British remained a rather loose collection of banks. It was often the case that bank representatives met to share views. But with the exception of the TSB College and specific developments around computer applications, very little emerged in terms of co-operation and joint ownership.

### **3.2 The early computerization of the TSB**

Increasing demands to replace manual systems for mechanised accounting of ledgers and to modernise obsolete accounting machines, combined with the impending decimalisation of sterling, the extension of administrative systems for the centralisation of customer information (at head offices of individual banks), and the increase in the numbers of transactions at the teller, resulted in the Trustee Savings Bank Act (1968) making provisions for financial assistance to be given to groups of savings banks for the acquisition of mechanical and electronic processing equipment.<sup>2</sup> A large number of individual banks then structured regional computer consortia around six centres of the National Data Processing Service (NDPS), an independent subsidiary of the Post Office.<sup>3</sup> Once decimalisation had come about in February 1971, individual banks started to consider the development of an on-line system as had been developed in the North West and West Midlands (Newbold, 01 April 2008). It is worth noting here that British savings banks were by no means ‘trail blazers’ as savings banks in the US and Sweden had pioneered on-line computing in the 1960s (Bátiz-Lazo et al. 2009).

The Manchester and District Bank built a computer centre in Strangeways (Sale, Greater Manchester) and called it Manchester and District Computer Accounting

Project (MADCAP) (Taylor, 17 July 2008). Early in the process MADCAP and the West Midlands consortia committed to having their own computer centre running the same system while each built around and ICL System 4 (both of which were delivered in February 1971).<sup>4</sup> Yet other consortia found it too expensive to fully replicate the move that involved abandoning the NDPS system while purchasing their own computers. For instance, the York-based North East consortia, the biggest in terms of number of banks involved, could not really afford a real-time or even an on-line solution for every branch. As a result, the TSB in England ended up with four computer centres all running similar systems, with the North East running as a rather different system because of the on-line, off-line and manual nature of some operations in its retail branches.

In the mean time *ad hoc* management committees were developed as a way to keep some form of synchronization. The first to emerge to co-ordinate the first wave of computerization in the late 1960s was the Mechanisation and Methods Committee. This committee had some initial success. For instance, through it banks agreed to change individual layouts adopt a uniform passbook that could be updated mechanically (Moss and Russell 1994, 268).

Later on a TSB joint computer project was established within their industry body, that is, the TSB Association (Moss and Russell 1994, 268). This development followed regulatory changes (particularly those enacted in 1965) that relaxed the constraints on the TSB business portfolio (Bátiz-Lazo and Del Angel 2003, 357). As part of the initial steps to diversify their offering, the savings banks made a first approach to become members of the Committee of London Clearing Banks (CLCB) by joining their electronic clearing centre (namely London Clearing Banks' Inter-Bank Computer Bureau). But the TSB were denied entrance to the Inter-Bank Computer Bureau. The immediate effect of this rejection was that the remit of the TSB joint computer project 'was extended to provide advice and technical support to the Association.' (Moss and Russell 1994, 268).

Between 1970 and 1972 the Association, through the TSB joint project, worked towards a co-ordinated and coherent strategy in the installation of computer systems. Regular meetings were arranged of the chairmen of the eight computer consortia in Britain, namely Scottish, South-Eastern, Bootle, West Midlands, MADCAP, North-East and Midlands and Belfast. However, general managers of the independent banks were

keen to prove their independence. They were wary that that the result of the computer consortia would make it almost impossible for trustees of individual banks to exercise any effective control over their business. As noted by a contemporary observer:

“...This is the kind of debate that was taking place around that time and because everyone was independent. They said: ‘we can’t afford to do that, we manage alright’ and they could never get any kind of agreement on that and there was an exchange of ideas between people there but it came to nothing in the sense that everyone went away and decided what they were going to do or not do and often it depended on trustees back then, if the trustees would support what was being suggested. So then they changed it again and it became another mechanisation, another committee. They failed continually to agree on anything and then what happened the whole thing fractured as everybody went away to do their own things you see. The Scots went off to America and saw Burroughs operating there and they came back wanting to do that. The first reaction from the National Debt Office was: ‘no, you’re not buying American we have got an ICL here, we should be thinking about using them.’”(Taylor, 17 July 2008).

The joint computer project led to the formation the TSB Computer Services Ltd. in 1972 (Moss and Russell 1994, 272). It was to own and manage computer facilities in Altrincham on behalf of the Association (*idem*). Integral to the formation of this subsidiary was the opportunity to progress a coherent strategy for the use of computers throughout all the banks. At this point, the National Debt Office (NDO) had made available £10 million for individual banks to invest in computer technology (*idem*).

There was a sense of urgency from the NDO that future investments in computer technology should pay greater attention to cost-effectiveness (particularly achieving savings in staff time) rather than the suitability of automation for specific tasks. A small group of system specialist in Manchester was formed with responsibilities for drawing specifications and processes. This group was called Computer and Research Development Unit (CRDU).

The publication of the long-awaited recommendations of the Page Committee in June 1973 gave greater clarity for the future of the TSB. Among other things the committee formally recommended the TSB to amalgamate into a single entity. It also resulted in the formation of a Central Board and a Steering Committee in 1975. The Central Board comprised the chairmen and general managers of the regional banks thus giving some room for former trustees to remain engaged with the TSB. The Steering Committee was populated by the senior general managers of the regional banks and it was in charge of setting policy for the TSBs.<sup>5</sup> There was also a Liaison Committee which, smaller in number, was responsible to see how the policies agreed by the

Steering Committee were actually implemented. Tom Bryans, who led the pioneering efforts in computerisation at the Belfast bank, was named the first chief general manager of the TSB in 1975.

Prior to that, in 1974, the London Saving Bank had abandoned its plans to go on-line while the Scottish banks, serviced through the Savings Banks of Glasgow, remained committed to their Burroughs off-line system as still more cost-effective than available on-line, real-time (OLRT) system in other savings banks. Meanwhile the Northern Ireland TSB, using Burroughs computers in its on-line system, refused to join the larger Altrincham-based consortia with ICL machines. Unable to secure a single national system, the chairman of TSB Computer Services, speaking at the Association's annual meeting in May 1975, cautioned that clearing banks were taking the advantage in on-line technology (Moss and Russell 1994, 282). Panic stricken, regional managers decided to push ahead with computerisation.

The Mechanisation and Methods Committee was replaced by an Automation Committee, which was form which advised the Steering Committee on issues related to computerization.<sup>6</sup> The role of the Automation Committee was to provide a 'common denominator' in matters relating to computer policy across regions. The Automation Committee was divided into a Computer and Mechanisation Sub-Committee and a Computer Technical Sub-Committee (Moss and Russell 1994, 271). The latter draw specifications and processes and these were then circulated amongst the rest of the TSB. However, the life of the Automation Committee was also short as it was replaced by the Board of TSB Computer Services.

The inauguration of a new computer centre in Wythenshawe in 1979 replaced the four consortia using the Altrincham computer centre (namely Kidderminster, York, Bootle and Manchester) plus the previously off-line South West consortium. In 1985, Scotland was the last region to merge operationally with the rest of the TSB and amalgamate its computer operations with the OLRT centre in Wythenshawe. A year later and following Thatcher's privatization programme, the TSB Group was floated in the stock exchange in 1986. All the proceeds of the floatation were used to capitalize the TSB Group given the unique corporate governance of the savings banks in Britain. Even before floatation it was evident that collaboration through common forums had proved somewhat ineffective form of co-ordination for the TSB.

## 4 Cementing technological change through a tight industry association in Spain

### 4.1 Achieving critical mass through collaboration

The course of the first quarter of the 20<sup>th</sup> century saw competitive pressure increasing for the Spanish savings banks from two sources (Garcia Delgado 1984, 166). On the one hand, the government established a number of retail financial intermediaries such as the Post Office Savings Bank in 1916. On the other hand, greater balance-sheet strength enabled commercial banks to develop national retail bank branch networks. Alongside this expansion, commercial banks created special saving sections within their retail bank branches to attract deposits from households while competing head on with the savings banks (Maixé-Altés 2009a).<sup>7</sup> Competitive pressure continued to increase with the passing of the first banking law in 1921 and the simultaneous creation of the *Consejo Superior Bancario* (Banking Council).

A defensive move by the savings banks to these developments was the creation of regional associations. The first of these was the Basque-Navarre federation, established in 1924. It was followed by similar associations by banks in Galicia, Castile and five other regional associations. In 1928 the independent federations of savings banks amalgamated into the *Confederación Española de Cajas de Ahorros* or CECA (Spanish Confederation of Savings Banks) (Maixé-Altés 2005; Comín 2008, 102).

Another important development took place in 1933 with the passing of a new Savings Banks Statute. At the same time, ‘central’ savings bank or wholesaler of retail finance was established. The ‘central’ or main clearing bank for savings banks was called the *Instituto de Crédito de las Cajas de Ahorro* or ICCA (The Savings Banks Credit Institute). This kind of institution dated to the early 20<sup>th</sup> Century and was pioneered by *Skopbank* in Finland (established in 1908), *Fellesbanken* in Norway and ICCRI in Italy (both established in 1919). The central bank for the Swedish savings banks (*Sparbankernas bank*) was created in 1942, whereas the Central Trustee Savings Bank Ltd. was established in 1972. ‘Central’ banks were membership owned and they had little influence on members’ strategic or operational matters. Their aim was to service the needs of participating institutions often in a representative capacity but also in areas where necessary economies of scale were beyond the individual member (Revell 1991). The ICCA formally disappeared in 1971, its control and supervision

duties were absorbed by the Bank of Spain and its clearing functions by the CECA (Comín and Torres 2005).

By 1970 the CECA had considerable credibility and regarded to represent the views of savings banks. The end of Franco's regime and the start of the new democracy (*circa* 1962 to 1977) was a period in which the savings banks' collaborative strategies evolved to reduce their competitive disadvantage relative to commercial banks. This was a period of strong growth of the Spanish economy.

As a collectively owned central operator CECA became the main recipient of savings banks' cost-reduction outsourcing strategies (including applications of information technology) and clearing activities. Although each savings bank had an independent treasury department, the risk-diversification of the system meant that as a group the savings banks' cost of funds was one per cent below that of commercial banks (Grimá i Terré and von Löhneysen 1991). This advantage continued throughout the 1980s.

The gradual removal of regulatory barriers allowed the CECA to offer its associates access to shared resources, with the end result of achieving economies of scale that allowed independent savings banks the development of previously non-existent competitive capabilities. These developed regardless of differences in size and business volume.

Meetings at CECA's head office acted as the main hub or centre spoke in the saving banks' network where issues regarding differences in capacity, power of negotiation, aims and objectives were resolved amicably and effectively. There was a tension in every project where, on the one hand, individual saving banks' aspired to maximize value added in return for their collaboration. On the other hand, there was confidence and trust resulting from the success of previous partnerships. Hence, trust was an important factor to compensate for disaggregating forces (see further Comín 2008). Indeed, Merret *et al.* (2008) emphasise the high level of trust created through internal cohesion was one of the success factors for the Melbourne Woolbrokers Association (a wool shelling industry association highly successful in fostering competitive collaboration that improved market efficiency).

At the end of the 1980s all CECA members remained legally and functionally independent and, contrary to other European experiences, the national association had

not grown into a single franchise (de la Hucha and Antón 1991, 130). New regulation introduced in 1988 removed restrictions for the location of retail branch outlets and enabled individual saving banks freedom to expand their retail branch network across the whole country. A crucial period started for CECA because the bigger saving banks pursued distinctive diversification strategies, such as expanding their retail branch networks or purchasing failed co-operative banks (circa 1987). As a result, in the early 1990s CECA's role changed from being simply an industry association to actively offering outsourcing possibilities (including computer applications).

During the 1990s the saving banks had to update legacy investments in computer technology. At the same time, a new organisational structure was introduced at CECA and as a result a general manager appointed, namely Juan R. Quintás, a former academic and management consultant (Comín 2008, 451-460). Quintás was instrumental in CECA retaking the initiative as the main recipient of outsourcing strategies. Renewed collaboration between Spanish saving banks then transformed to 'competitive collaboration' or the search of joint developments with the specific intent to strengthen the competitive position of those involved (Bátiz-Lazo 2004).

#### **4.2 Initial steps in computerization and data transmission**

Just as the TSB prepared itself for decimalisation and set up the TSB joint computer project through their national association in the late 1960s, the Spanish association in 1962 established a team of computer experts that were to become the basis of CECA's Computer Department.<sup>8</sup> Luis Coronel de Palma, Director General of CECA at the time, was the driving force to bring about the mechanization and automation of accounting processes inside CECA. The decision to adopt computer technology in CECA resulted from the development of a joint computer project with some of the most 'dynamic' savings banks. In the second half of the 1960s, many of the smaller saving banks followed suit by incorporating IBM 360/30 and Phillips Data 4000 computers. Widespread adoption of mainframe computers enabled the adoption of common processes and procedures around the issuing of loans and deposit taking. A high degree of uniformity was important later on to adopt a common approach to selling stocks and shares as well as incorporating all of the saving banks retail branch networks to a single computer system (Maixé-Altés *et al.* 2003, 255-6).

In tandem with these developments and just like the large saving banks in Belfast, Glasgow, London and Manchester had set up their own independent computer operations, the large Spanish saving banks (such as those in Barcelona and Bilbao) developed independent computer centres and computerised accounting processes. The latter largely aimed to facilitate the centralisation of a number of ‘back office’ processes within central computers at head-office. A noteworthy example of an independent move to computerise was that of the *Caja de Pensiones de Cataluña y Baleares* (La Caixa). In the early 1960s, this large saving bank hired IBM to carry out tests for electronic data transmission using conventional telephone lines and an IBM 1001 computer. The aim was to link the computer centre at head office in Barcelona with operations in Madrid and, independently, with those in Palma de Mallorca (Martín Tardío 2009).

These and other first steps in electronic data process (EDP) in the Spanish business sector were possible thanks to the early efforts to develop an electronic communications infrastructure by the national Spanish telephone company, *Compañía Telefónica Nacional de España* (CTNE).<sup>9</sup> In 1953 and as a result of the Pact of Madrid between Franco and Eisenhower, Spain gained access to the US Technical Assistance and Productivity Programme (USTAPP). An immediate consequence was the collaboration between CTNE in setting up a communications and data transmissions networks to link US military installations in Spain with the Pentagon in Washington. A similar project took place with the National Aeronautics and Space Administration’s (NASA) operations in Spain.<sup>10</sup>

Following these early developments the CTNE began to offer similar services to business users and established a department dedicated to servicing the latter in 1965. By 1969 these included the airfare sales and reservations system of the Spanish airline company, *Iberia*; ticket sales for the sole train operator, *Red Nacional de los Ferrocarriles Españoles* or RENFE; and La Caixa which, as mentioned, had already established circuits of EDP networks in large urban centres (such as Madrid and Barcelona) and replaced the IBM 1001 with an IBM 30/40. Moreover, at this point in time La Caixa engaged in testing the capacity of CTNE’s capabilities while ascertaining the feasibility of deploying an EDP network that would link its 212 retail branch outlets, 1.6 million clients and 52 million operations in Catalonia and the Balearic Islands (Martín Tardío 2009). Other EDP financial intermediaries users included *Caja de*

*Granada* (NCR 315), *Banco Central* (IBM) and *Banesto* (NCR 270) (Arroyo Galán 2006).

Not surprisingly, in 1972 a forecast for top EDP users predicted that in 1985 the demand from financial services in the USA would rank eight, while the same forecast for the demand in Spain ranked financial services first (Martín Tardío 2009). The difference in the forecasts suggested that teleprocessing was expected to become more popular amongst the large and densely populated retail bank branch networks of European banks than amongst the geographically constrained expansion of the US retail banking model.

In summary, by the late 1960s the Spanish industry association (CECA) had been active in helping its members to explore applications of computer technology. Moreover, some of the larger Spanish saving banks (as measured in terms of assets) had taken successful steps in teleprocessing. This at the same time that British saving banks had not even begun to seriously considered ways to automate internal processes and procedures.

### **4.3 The Spanish Automation Committee**

From the late 1960s and with greater intensity during the 1970s, the Spanish industry association (CECA) began to steer its members towards a more collaborative strategy. With hindsight, this move proved very successful in preparing Spanish saving banks for domestic and international regulatory and competitive changes taking place in retail banking during the 1980s and 1990s.

As mentioned and in stark contrast with the restrictive regime in Britain, Spanish saving banks were able to offer a much more diversified array of products and services. Co-operation and shared investment to develop applications in computer technology effectively allowed small and medium-sized saving banks to offer products and services to ultimate consumers in the same conditions as commercial banks. The corner stone of these developments roots to a meeting in the coastal town of Sitges (Barcelona) in 1969 where the IV<sup>th</sup> World Saving banks International Conference on Automation was taking place. During this meeting a group of directors of Spanish saving banks pointed out the need for a specialised service centre that would deal with computer issues. They also noted that the service should be centralised within the Spanish national association for the service to act as advisor on computer technology to all saving banks.

The idea of a centralised technical service mirrored similar developments in saving banks in West Germany and Scandinavia.<sup>11</sup> CECA's *Comisión Permanente* (Board of Directors, the forerunner of the current governing body), eventually agreed to the creation of something along the lines proposed at Sitges and in February 1970, representatives from 28 saving banks and of CECA established the *Comisión de Organización y Automatización* or COA. Its main objectives were:

1. Create a national database for mechanisation
2. Enable knowledge interchange amongst the saving banks
3. Study the creation of *Centros de Cálculo* (Computer time sharing centres) at a national and regional level
4. Standardisation of printed material and procedures
5. Carry out organisational and mechanisation studies
6. Publish research papers of international standing

Early in 1971 the COA started deliberations to set up an ambitious intercommunication project amongst the computer centres of the saving banks which aimed to be operational by 1978. However, it immediately became evident that the COA and other pre-existing committees within CECA (such as the Current Accounts Commission and the Service Commission) had overlapping objectives and were competing against each other to deliver similar applications of computer technology. CECA's response encompassed a restructuring of its technical committees which delivered a new organizational structure specifically aimed to tackle the challenge posed by technological change.

Formally known as *Comisión de Organización, Automatización y Servicios* or COAS (Organization, Automation and Services Committee) and established in May 1971, its membership was composed of representatives of different savings banks.<sup>12</sup> Although CECA had formal control over the COAS through CECA's *Secretaría Técnica* (Technical Information Office), the COAS was granted an independent charter and an organizational structure that effectively enabled the swift creation of joint projects to develop computer applications that were co-ordinated through *ad hoc* committees.<sup>13</sup>

Individual banks then elected to be part of one or several committees as each individual committee within COAS structured to co-ordinate investments and develop one or many specific computer applications. Listing all of these *ad hoc* committees would be too lengthy. Instead, what follows describes the most successful applications that resulted from these partnerships. Admittedly, the story below may portray a rosy picture of successful practices around COAS. By no means was this story free from error and failure. But rather than portraying how learning modified existing practices and knowledge, our aim below is detailing how the relative success of collaboration provided incentives for savings banks to increasingly build around existing circumstances. In other words, consolidating technology networks under the ‘control’ of the COAS created incentives to adopt common processes and applications by reducing the risk failure associated with innovation (see Koschatzky 2002).

We thus provide further evidence of how technical and administrative standards emerging from collaboration profoundly influenced the nature and rate of deployment of subsequent technologies (David 1985; Arthur 1989; Cortada 2008b, 5). Here ‘history matters’ not as a sub-optimal or random outcome but event as developments were shaped by the combination of circumstances, emergent strategies and systematic planning (Liebowitz and Margolis 1990; Liebowitz and Margolis 1995; Heide 2009).

#### **4.4 The COAS and the implementation of information technology**

Table 1 offers a selection of the large number of projects involving Spanish savings banks aimed to develop of computer applications and EDP from 1960 onwards. As proposed by Bátiz-Lazo and Wood (2002, 1-2), these were sorted into discrete periods to better understand how specific applications of computer technology were deployed to modify the point of contact with customers (i.e. innovations in service offering) as opposed to those aimed at achieving greater scale and increase efficiency of internal activities (i.e. innovations in operational function). Originally these dimensions and periods were drafted to explain technological change in UK-based organizations (with a running comparison with developments in the USA). However and as illustrated below, these have shown to be helpful in explaining macro patterns of adoption and use in other geographies once appropriate allowances for idiosyncratic developments were made.

**Insert Table 1 around here**

As noted in Table 1, one of the noteworthy innovations in operational function date to 1970. Just as the British TSB's adopted computer centres on a regional basis, through the COAS the Spanish savings banks set up bureau services in Torrente (Valencia) and Sabadell (Catalonia). However, the rapid development of a new generation of computers which were both cheaper and smaller, was to favour the computerization of individual savings banks and consequently there was an adjustment in COAS's information technology policy.

This was reflected in raising the strategic priority of a project to design and develop an interconnection system for data transmission among saving banks while using conventional telephone lines. Work in this project had started in 1968 by CECA in partnership with CTNE. It was rebranded 'Intertelex' when formally launched in 1970. On-line connection was established in 1974 linking the computers of four of the biggest saving banks – La Caixa, Barcelona, Zaragoza and Bilbao. The remaining saving banks linked up through terminals. This system was called *Sistema de Interconexión de Cajas de Ahorro* or SICA (savings banks interconnection system).<sup>14</sup>

Negotiations taking place between 1979 and 1980 resulted in CECA and the saving banks agreeing on further developing SICA by establishing a network directly linking individual main frames or mini computers (as appropriate). But it was until 1988 when all the saving banks had been integrated into this on-line, real time system.

Electronic data processing infrastructure developed around SICA was important to build domestic interconnection among the savings banks but also to link them with international financial markets. This started in 1981 when CECA gain access to the Society for Worldwide Interbank Financial Telecommunication (SWIFT). The savings banks then agreed to use SICA in support of a single point for SWIFT exchanges. Wholesale international transactions on behalf of the saving banks began in 1987. These services developed into CECA's representative offices in major international financial centres and 1,300 correspondent agreements with banks in 88 countries. Through these trading operations CECA became the third biggest Spanish player in spot currency transactions.<sup>15</sup>

Table 1 also notes that a large number of projects around COAS related to innovations in service offering. New services for retail customers included the development of the joint cheque guarantee card launched in 1971. Initially each of the handful of pioneering banks had its own card but all these were rebranded *Tarjeta 6000*

in 1975. By 1979 there were 35 banks offering *Tarjeta 6000* when the decision was made to centralise the management and consolidate the clearing of saving bank transactions at CECA.

At the same time, interaction through the industry association helped in the diffusion of payment with debit and credit cards. In 1979 CECA and the savings banks discussed the possibility of offering a credit card under the marquee of Visa, American Express or Mastercard. But in 1980, Visa España was created and many savings banks joint it. Also in 1980 and following a proposal by the French firm Sligos, COAS set up a working group to examine the possible transformation of the cheque guarantee card (*Tarjeta 6000*) into a debit card. This feature was introduced that same year. Shortly after credit card facilities for *Tarjeta 6000* developed under the Visa marquee in 1982. CECA then developed capabilities to act as a single clearing point while representing saving banks in the international credit and debit card clearing of VISA and later in MasterCard.

Another noteworthy development around the industry association relates to the deployment of technology for cash dispensing and electronic payments at point of sale (EFPOS). A first network of automated teller machines (ATM) and EFPOS in Spain built around the main commercial banks namely Banesto, Banco Central, Banco Hispano Americano and Banco Santander. It was established in 1974 under the brand name *Systema 4B*. But while British banks had been pioneers in the installation of cash dispensers during the early and mid-1970's (Bátiz-Lazo *et al.* 2009), the Spanish savings banks were somewhat late adopters.

Although the savings banks were formally introduced to cash dispensing technology through a presentation at COAS by the computer and ATM manufacturer, Burroughs in 1974, it was until 1979 when COAS created an ATM working group with representatives from the biggest savings banks (namely La Caixa, *Caja de Bilbao*, *Caja de Madrid*) and CECA. By 1980 five independent ATM networks had been deployed but the general public had been slow in taking up this service as transaction volume was below expectations. CECA then began a policy to revitalise and promote commercialisation of the cash dispensing service. By 1982 there were 200 ATMs throughout 19 provinces. By 1983 there were 47 savings banks offering cash dispensing services through a fleet of more than 800 machines (see Figure 1).

**Insert Figure 1 around here**

As suggested in Figure 1, the size of the ATM fleet in Spain grew fast while reaching 1,315 in 1984. This was in large thanks to the introduction of a new generation of cash machines as well as the passing international standards relating to the physical characteristics of plastic cards, information contained in the card's magnetic strip and the protocols for the interchange of bank information (see further Bátiz-Lazo 2009). All this plus centralisation of clearing operations at CECA together with the advent of further innovations in business applications of computer technology (such as database management systems, off the shelf software, greater storage power, etc.) made it easier to achieve interoperability amongst saving banks' ATM fleets.

However, these same advantages allowed the deployment of ATM by savings banks independently of developments at CECA. This was the case of *Servired*: a new ATM network set up in 1985 and whose machines were activated exclusively by Visa cards. This network was set up by banks and savings banks outside of *Sistema 4B* and CECA's *Red 6000*.

Nevertheless, the advantages of gaining scale and scope through collaboration were evident: by the mid-1980s there was a total of 2,907 ATMs in Spain of which 60.4 per cent belonged to the savings banks' *Red 6000*. By the end of the decade there were 14,432 ATM's, 65.3 per cent of these were installed by the savings banks and had full interoperability through CECA. This meant that in 1990 the number of deployed ATMs per capita by Spanish savings banks was 25 machines for every 100,000 inhabitants, that is, approximately the same number per capita of the fleets of British banks, savings banks and building societies taken together.

In the absence of appropriate estimates for optimal number of cash dispenser per capita for Spain and the UK, it is hard to support a rather simplistic view that the comparison above would consider that, in the case of ATMs, Spanish savings banks outstripped the 'pioneering' UK savings banks. Instead, the above comparison hides is that the rapid growth of cash dispenser technology in Spain was accompanied by much greater functionality than counterparts in Britain. This suggests that the possibility to secure economies of scope and scale through collaboration (that is, positive network externalities) facilitated an accelerated the processes of adoption of new application of computer technology.

Finally, just as CECA was to spearhead the link of Spanish savings banks with international wholesale financial markets, the industry association was key in the creation of international links amongst retail bank markets. For instance, in 1985 CECA became involved in an international project led by the *Istituto per L'Automatizzazione delle Casse di Risparmio Italiane* or IPACRI (Italy) with the collaboration of representatives of the British saving banks. The partnership of Spanish, Italian and British savings banks presented a technical proposal to the European Savings Bank Group that was developed in 1988. As a result of this proposal an international partnership of savings banks based in Belgium was established and called EUFISERV. Established as a result of a meeting Valencia in 1990, EUFISERV aimed to develop an European project for the interoperability of domestic ATM fleets. As a result of this collaboration, SEINCA (1988-93) was created and it brought together 68 Spanish saving banks and CECA, IPACRI and two technology partners - Ibermatica (sponsored by the Spanish saving banks) and ERITEL (Ibermatica and CTNE).<sup>16</sup>

## **5 Conclusion**

As suggested by Williamson (1989) otherwise independent organisation articulate collaboration through networks when these offer the possibility to reduce uncertainty and risks associated with innovation. Research in this article supports this view as it documents evidence telling of implementation of applications of computer technology by Spanish and British savings banks through collaboration which specifically intended to overcome the technical barriers and share investment costs. However, the level of commitment, of collaboration and the structure of the committees in both cases was very different, as were the results. The radical regulatory changes which occurred in the UK during the second half of the 1980's together with a somewhat less than solid collaboration structure among the TSB, were the principal factors that distinguished these from there rather more successful Spanish counterparts.

Network economics provided a useful means to understanding the way in which the collaborative structure of the CECA became firmly established during this period. The confidence that existed among the CECA members and the mutual orientation of their interests produced beneficial interactions. At the same time, the link to an institution like the CECA, while it wrested a certain degree of independence, provided a means of fructiferous collaboration (Domrös 1994, 35).

The characteristic flexibility of networks can be perceived in the practices of the TSB and COAS *ad hoc* committees. The entry of new members took place depending on the interests of each savings bank which could decide whether or not it would participate in the project. Hence, although all of the entities belonged to the same organization, they had much greater room for manoeuvre. As Le Bars *et al.* (1998) indicate, the capacity for innovation grows, as and when each participant involved in the network becomes capable of integrating external knowledge. In this sense, the savings banks, particularly in the case of Spain, managed to obtain economies of scale thanks to external resources. In the case of the TSB its capacity for accessing external resources was high, although the diffuse nature of this collaboration watered down the advantages of the collaboration process. Thus, the flexibility of the COAS model favoured decision taking within the technological and organizational arenas in the face of a new generation of computers which broke into the market at the beginning of the 1970's. The TSB therefore, since they did not have access to these models, had much greater problems in adapting to the emergent information technology.

The regional dimension of the British computer consortia and the markets in which the Spanish savings banks were carrying out their activity, sometimes regional and sometimes provincial, reinforced the respective structures of the networks on which their collaboration was based. De Bresson y Amesse (1991, 570) state that the development of the networks is more robust if the participants share the same cultural and social background. In this sense the regional and spatial components provide a stabilizing influence on collaborative practices. These factors are deeply entrenched within the structure of the savings banks, particularly Spanish savings banks which are organized as regional federations.

In summary, in both Spanish and British savings banks there were institutional structures which were conducive to the creation and consolidation of collaboration through networks (see Tötling 1994, 324). Even though the intensity of these links and their institutional consolidation was different, the empirical evidence points to the fact that said collaborative structures were sources of economies of scale and scope, the so-called positive network externalities. Research documented in this article thus support the idea that collaboration can enable the creation of inter-organisational processes and procedures to distribute otherwise inaccessible information. The development and transformation of competitive capabilities of one or all of the partners, therefore, should

be seen as the appropriate indicator for successful collaboration (Ross 2002, 56). However, the intensity of competition could remain unchanged unless opportunities opened by collaboration are implemented successfully (Bátiz-Lazo and Del Angel 2003; Bátiz-Lazo 2004).

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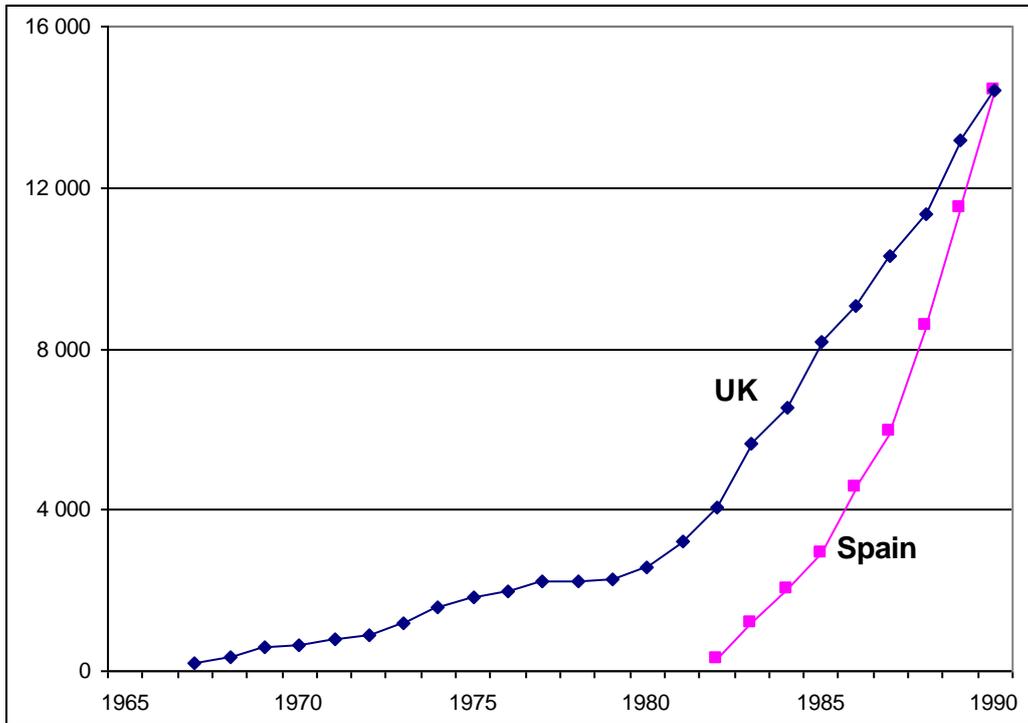
**Table 1: Selection of Computer Applications Used by Spanish Savings Banks, 1960-1989**

Period	Innovation in Service Offering	Innovation in Operational Function
Specific Application (1960-67)		<ul style="list-style-type: none"> <li>▪ La Caixa's EDP links Barcelona with Madrid and Palma de Mallorca</li> <li>▪ Computerisation of accounting processes: NCR 315 at CECA and NCR 390 at some smaller savings banks (1962-3)</li> <li>▪ Widespread adoption of mainframe computers by individual banks (among others IBM 360/30 and Phillips Data 4000)</li> </ul>
Emergence and Early Use (1968-79)	<ul style="list-style-type: none"> <li>▪ First cheque guarantee cards project (1971-73)</li> <li>▪ Payment of household bills (mainly utilities) by direct debit (1973-9)</li> <li>▪ Cheque guarantee cards rebranded <i>Tarjeta 6000</i> (1975)</li> <li>▪ Savings banks' petrol payment voucher: <i>Auto 6000</i> (1977-1979)</li> <li>▪ Direct payroll payment through deposits (1973-9)</li> <li>▪ Deployment of <i>Visa España</i> payment network by 56 commercial banks, savings banks and co-operative banks (1979)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Establishment of COAS (1969-1971)</li> <li>▪ Regional computer centres (Torrente and Sabadell, 1970)</li> <li>▪ First attempts at an electronic clearing system (1968-73)</li> <li>▪ On-line link of mainframe computers (1974-1988)</li> <li>▪ Computerisation of savings banks own payroll (1974-6)</li> <li>▪ Establishment of ATM committee by COAS (1976)</li> <li>▪ <i>Tarjeta 6000</i> grows to 35 savings banks and its management is centralized at CECA (1979)</li> </ul>
Widespread Diffusion (1980-89)	<ul style="list-style-type: none"> <li>▪ Off-line ATMs by 47 savings banks (1980-85)</li> <li>▪ First EFTOS project (1981)</li> <li>▪ <i>Tarjeta 6000</i> offers debit card facilities (1980)</li> <li>▪ <i>Tarjeta 6000</i> offers credit card facilities as a Visa marquee (1982)</li> <li>▪ <i>Servired</i> new ATM network: activated exclusively by Visa cards and set up by banks and savings banks outside <i>4B</i> and <i>Red 6000</i> (1985)</li> <li>▪ On-line ATMs through CECA, called <i>Red 6000</i> and activated using <i>Tarjeta 6000</i> (1986)</li> <li>▪ Widespread deployment of EFTPOS (1986)</li> <li>▪ Interoperability amongst ATM networks (savings banks' <i>Red 6000</i> and commercial banks' <i>4B network</i>, 1989)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Inter-banking committee: joint organization by commercial banks (<i>4B Network</i>) and savings banks aiming at clearing operations and operative services (1980)</li> <li>▪ Savings banks join <i>SWIFT</i> through CECA (1981)</li> <li>▪ Savings banks joint ATM European project (called CAUCE) launched by CECA - Spain, IPACRI - Italy and TSB – UK (1984-85)</li> <li>▪ Banks, savings banks and co-operative banks establish <i>Sociedad Española de Medios de Pago</i>, SEMP co-ordinate payment clearing networks (1984)</li> <li>▪ All direct payroll payment services are centralised at CECA's <i>Central de Recibos</i> (1986)</li> <li>▪ First trial of smart cards (TIBC) by banks and savings banks (1989)</li> </ul>

Sources: Bátiz-Lazo and Wood (2002, 2); CECA, Secretaría Técnica de la COAS; Servired; and authors

**Figure 1: Total Cash Dispensers and ATM in Spain and the UK, 1965-1990**

(Deployment by savings and commercial banks in Spain;  
clearing banks, savings banks and building societies in the UK)



Sources: CECA, Red 4B, Servired (Spain);  
CLCB (1978, 57) , Bátiz-Lazo (2009, 15) (UK); and authors.

## NOTES

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<sup>1</sup> Many of these associations made effective representation in front of their government on behalf of their members. Indeed the American association became the one of the most powerful financial lobbies in Washington, D.C. (Mason 2004).

<sup>2</sup> TSB Inspectors Committee No. 73 (1969), paragraph 20 and TSB Inspectors Committee No. 80 (1971), Premises and Computers (paragraph 30).

<sup>3</sup> *The Times*, 12 January 1970, 19 January 1970 and 15 October 1970. By October 1970 the NDPS centre in Leeds was servicing 23 TSB banks and was said to be in the process of incorporating into the computer system 450,000 accounts and 45,000 standing orders.

<sup>4</sup> Unless otherwise stated the remainder of this paragraph borrows freely from Read (17 July 2008).

<sup>5</sup> Unless otherwise stated the remainder of this paragraph borrows freely from interviews with Newbold (01 April 2008), Read (17 July 2008) and Taylor (17 July 2008).

<sup>6</sup> Unless otherwise stated the remainder of this paragraph borrows freely from interviews with Newbold (01 April 2008), Read (17 July 2008) and Taylor (17 July 2008).

<sup>7</sup> See Anuario Financiero y de Sociedades Anónimas de España (1916, several years), Madrid, Daniel Riu.

<sup>8</sup> Interview to José Esteve, Senior Director of CECA Computer Department from 1962 to 1995 (25-9-2007).

<sup>9</sup> Created in 1924, in 1945 the Spanish government grant it the monopoly on telecommunications. This regime was relaxed when it was privatised in 1997.

<sup>10</sup> Shy (2001, 7-8), notes that advances of computer and telecommunications in Europe between 1950 and 1980 largely resulted from collaboration between private sector organisations and government owned monopolies in sectors with strong network economies (such as telephone, post and television).

<sup>11</sup> CECA, Circular 12/1970, 6 January.

<sup>12</sup> CECA, COAS Minute, 29 May 1971.

<sup>13</sup> In the 1980s some of COAS committee merged: Comité de Responsables de Areas Técnicas, Comité de Operatoria Bancaria, Comité de Montes de Piedad, Comité de Seguridad, Comité de Medios de Pago, mas adelante sustituido por el Organo Rector del Sistema 6000 (CECA, Secretaría Técnica de la COAS).

<sup>14</sup> CECA, Secretaria Tecnica de la COAS, Informes.

<sup>15</sup> CECA, <http://www.ceca.es/cecasf.htm>, access date 15/Mar/1997.

<sup>16</sup> Ibidem.