

# Banking on Change: Information systems and technologies in UK High Street Banking, 1919-1979

**Bernardo BÁTIZ-LAZO**

Senior Lecturer in Banking, London South Bank University  
BCIM, London Road, London SE1 0AA, UK  
Email [bernardo.batiz@1998.alumni.man.ac.uk](mailto:bernardo.batiz@1998.alumni.man.ac.uk)

**Peter WARDLEY**

Principal Lecturer in Modern Economic and Business History,  
University of the West of England  
School of History, St Matthias Campus, Oldbury Court Road, Bristol BS16 2JP, UK  
Email [peter.wardley@uwe.ac.uk](mailto:peter.wardley@uwe.ac.uk)

## **Abstract**

*This paper explores the automation of the supply of financial services on the British High Street. Its aim is to provide an historical perspective to highlight the longevity of organisational change in the financial sector and to emphasise its remarkable continuity: UK clearing banks and building societies had very specific problems and adopted particular responses. It also indicates the close correspondence of organisational change with assessments by senior bank staff of both technological opportunities and the reception to change of bank customers. Office mechanisation (from the introduction of office equipment and “mechanical banking” in the inter-war years to its culmination with computer technology in the late 1950s and beyond) was introduced alongside the development of new capabilities. Technological change eventually offered others the potential to compete in bank markets. However, time and again, and despite a broadening of the range of financial institutions which provided competing services, technical change associated with long-standing experience resulted in a strengthened competitive position for already established participants.*

**Keywords: banks, building societies, technological change, management accounting**

## **1 - Introduction**

Since their earliest days in the late seventeenth century, English banks have undergone a consistent process of change which has changed their nature, size and structure. In the last century they have also been the location of significant technological change – though this has been change in the application of new technology rather than the development of novel machinery. And in the application of waves of new technology, the banks have both adapted to change what they do and how they do what they do.

Inevitably, given the specific interests of this conference, the nature of mechanisation and the type of technology introduced to achieve ‘modernity’ is a significant part of this article. However, we have tried very hard to avoid a tale of technological determinism. Rather we believe that the banks and building societies attempted to assess the costs and benefits

associated with the adoption of new technologies and act appropriately but, in so doing, were fully aware of the environment in which they undertook their business. During the last century Britain has changed in significant ways, and the banks have played their part in fostering and responding to these changes, be they economic, social, or political. Consequently, there are parts in this story for a number of factors additional to the onward march of technological progress; among these can be included: increased professionalism, and the development of the managerial class; changing perceptions of gender; the impact of war; and the role of the state. Although new technology underpins these developments, these are the themes which also enlighten our story.

In our story the most important role is played by managers. For the most part, despite some obviously inappropriate decisions made with regard to the adoption of technology, it appears that they got things about right. What is, perhaps, more interesting, is that when inappropriate decisions were made, recognition of this led to benign consequences for the individuals concerned. For example, after Barclays' misadventure with the adoption of a single mainframe computer system based on the Burroughs 8500, the senior managers who had determined this course of action suffered no long term career damage (Ackrill and Hannah, 2001, 73-6). Obviously, with regard to the adoption of new technology risk taking was regarded as more profitable, if not immediately more lucrative. It is also worth pointing here that this was one of the few occasions, if not the only occasion, when a British bank deliberately adopted "cutting-edge" technology and when bank staff appear to have been involved in the determination of technological specifications of that new technology.

We provide a detailed discussion of the nature of technology-using innovation in different types of financial intermediaries to illustrate the motivation and "rationality" (albeit "bounded rationality") of the senior managers of Britain's financial institutions. Different examples help to show the circumstances which constrained technological adoption and the determinants which influenced the nature of technological innovation in a variety of corporate settings. In particular, we discuss, to compare and contrast, the experience of enterprises in two initially distinct sectors within retail financial services, namely the retail operations of clearing banks and the building societies (Home Loan or Purchase Societies; originally mutual organisations). Where appropriate, we comment on the experience of institutions of very different size and with different ideological foundations.

A result of comparing and contrasting organisations in different sectors of UK financial services was identifying that the introduction of new technology, and the associated new managerial practices introduced with the new technologies, was diffused within banks and across the banking system. That is to say, each financial intermediary had to take a decision to adopt new technology and to decide the extent to which the new technology would be applied within that financial intermediary. As these decisions were made by each intermediary, at different times and with different speeds of implementation, the financial sector experience technological diffusion – a well documented behaviour as suggested by the diffusion curves identified by other investigators of technological adoption (Griliches: 1957; 1960).

## **2 - Accusations of Backwardness and the Rôle of Government**

Given the stress placed on the role of senior managers, Government is allotted here a relatively a minor rôle. Although much can be made about the relative importance of the US and UK governments in sponsoring the development of key machines and their application in their

countries (respectively Leslie, 2000, 49; Agar, 2003), our emphasis is the literature more critical of the performance of financial intermediaries and in particular the high street banks.

Government enquires as summarised in the Macmillan Report (1929), Radcliff Report (1959), National Board for Prices and Incomes' Report on Bank Charges (1967), Monopolies Commission ruling on the proposed merger of Lloyds Bank, Barclays Bank and Martin's Bank (1968) and the Cruickshank Report (2000) all coincided in criticising clearing banks (and to a lesser extent building societies) for failing provide venture capital to finance British industry as well as having poor internal control (more below). Hence, there were implicit and explicit accusations of "backwardness" (Jeremy, 1998, ; Booth, 2001, ; Billings and Capie, 2004).

To some extent clearing banks were responsible for these conclusions as they had failed to present successfully their case to the government (Billings and Capie, 2004). But at the same time, the accusations and alleged evidence of backwardness beg a number of questions including the expertise of those making the allegations, the standards by which backwardness could be found, and the degree and extent of backwardness actually found. These questions need to be answered in the context of the dominating view guiding banking regulation at the time of the enquiry as well as contemporaneous corporate practices in banking in the UK and elsewhere.

Analysis of the banking industry presents a paradox. On the one hand, financial intermediaries wish to appear as reliable and conservative institutions in the belief that a respectable reputation, even if it gives the appearance of staid behaviour, provides it with a solid and reliable corporate persona. On the other hand, risk is an essential feature of financial intermediation; a successful intermediary is one which not only manages well its costs but also makes profits by perceptively discounting risk. This paradox is apparent not only in day to day banking business but it is also visible in the corporate practices of any financial intermediary. For intermediaries it is essential that they adopt and adapt corporate structures and procedures which ensure internal accountability and appraisal of performance. In turn, internal accountability and appraisal of performance are implemented to ensure that established methods, practices and organisation, come constantly under close scrutiny.

Furthermore, with regard to decisions regarding strategy, internal accountability and appraisal provide an incentive for senior officials to be aware of, prepared for and equipped to assess the potential of new methods and techniques, not least when these are embodied in new technology. Although the public remain largely innocent of the strategies adopted by senior bankers to achieve these ends, generally held perceptions about the nature and effectiveness of financial intermediaries as organisations have always been crucial for a their success. Here these generalizations are examined in the context of the twentieth century British retail finance.

However, while clearing banks and building societies were evidently willing to innovate in their methods of keeping records, in various of the official reports to which the banking industry has been subject there is ample evidence of criticisms of, and signs of frustration at, the banks' use of management accounting.

In a wider context, Edwards (2000a, ; 2000b) and Wilson (1995: 29-31) argue that some economic and business historians may have underestimated the development and impact of cost or management accountancy over the last two centuries. For the most part, this research has concentrated on the manufacturing sector. Similar views of the lack of sophistication in management accounting in banks and building societies have been expressed in various

academic studies (Innes and Mitchell, 1997, ; Drury, 1998, ; Nightingale and Poll, 2000, ; Helliar *et al.*, 2002, ; Soin *et al.*, 2002, ; Bátiz-Lazo and Boyns, 2003). However, and reflecting this theme, the view that the major British clearing banks lacked sophistication in management has been challenged (Wardley, 2000, ; Booth, 2001, ; Wardley, 2003, ; Billings and Capie, 2004 ). They have argued that these banks, which for much of the twentieth century were large and complex organizations operating in a stable and concentrated industry structure, should be considered pioneers of mechanization and computerization

### **3 - Background**

British retail banking has seen at least four major innovative periods which have determined the fundamental nature of retail financial services in the United Kingdom. These developments did not occur simultaneously across the four territorial component parts of the United Kingdom but, with allowances made for temporal lags and leads, the significant features of each of these four periods were experienced across the kingdom with universal impact. Retrospectively, and taking the long view, we can see clearly the process by which a myriad of eighteenth century bankers were replaced eventually by a handful of financial conglomerates. The origins of modern high street banking in Britain are therefore found in small scale enterprises which can trace their origins to partnerships in the seventeenth and eighteenth centuries. In the case of clearing banks these were sometimes owned by an individual whereas building societies started in the 1770s as self-help groups of 20 to 30 members. So while clearing banks emerged with a profit motivation, the purpose of building societies was contributing funds and addressing the housing needs of a growing urban population (which, in turn, resulted from the first period of industrialisation).

Both clearing banks and building societies usually undertook their business from a single branch in the bottom floor of the head office building (often complemented with different types of agency relationships). Owners of banks were thus completely exposed to the consequences of unlimited liability while building societies would dissolve after having fulfilled their purpose of providing accommodation to its members.

Two major innovations in the financial sector were the creation of joint stock banks and the emergence of permanent building societies. In England this first stage was marked by the creation of the Bank of England in 1690, though the diffusion of this form of ownership was restricted by the Bank's close association with the Hanoverian succession and the monopoly powers granted by its charter. The legal constraints which restricted the expansion of joint stock banking in England were, first, relaxed outside the metropolis in 1826, extended to London in 1833 and then loosened to permit limited liability in 1858.<sup>1</sup>

'Permanent' societies emerged as these would remain even after satisfying the housing needs of the original founders. By the end of the nineteenth century permanent societies dominated the sector.<sup>2</sup> The passing of the Building Societies Act of 1874 limited the societies to accepting

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<sup>1</sup> Similar developments followed in Ireland with the creation of the Bank of Ireland in 1783 (which permitted the establishment of a parallel system based in Dublin) and branch banking after 1825. Developments north of the Tweed occurred even earlier. Scottish joint stock banking was firmly established before the end of the eighteenth century, with branch banking following quickly in the early nineteenth century.

<sup>2</sup> According to McKillop and Ferguson (1993), p. 6, by 1873 there were 540 permanent societies compared with 959 terminating societies. By 1912 the number of terminating societies had fallen to half the total of all societies and by 1936 constituted only 16 per cent of all societies. In 1980, the last remaining terminating society was dissolved.

deposits from the public and to making loans on the security of land. Excess funds were to be invested in either mortgages or government securities. In addition, societies were restricted in terms of merging with others and were protected from being controlled by another institution. The corporate status of building societies then emerged as mutuals: being owned by their 'investment' and borrowing members.

Building societies had thus capabilities similar to those of commercial banks but focused on long-term financing for the purchase of private dwellings and were excluded from money transmission transactions by lack of access to the clearing process (finally resolved in the Building Society Act of 1986). Building societies had to establish correspondent agreements with high street banks since the chief method of transferring money within Britain came to consist of the transfer of bank deposits through written instructions on debtor banks (more below). Nevertheless, building societies were successful in making significant gains, largely at the expense of clearing banks, in the retail deposit market (McKillop and Ferguson, 1993, 9).

As was the case of banks, rather than being equally distributed throughout the British isles, building societies emerged in the Midlands and from there they spread to the most prosperous towns and cities in the UK with their numbers being greater in the North and South East of England than in Wales or Northern Ireland. This regional segmentation of the United Kingdom's banking industry, with its geography largely based on national boundaries, was a significant characteristic until relatively recently.

The second transformation can be identified with the adoption of joint stock banks and the introduction on permanent societies was a process of amalgamation (Capie, 1988, ; Munn, 1997). Between 1850 and 1913 the number of banks in the UK dropped from 459 to 88, whilst the number of retail bank branches more than quintupled in number from 1,685 to 8,610 (Jeremy, 1998, 277). As a result, by the end of the nineteenth century banks had effectively developed national retail bank branch networks. Growth of retail bank branches reached maturity, if not saturation, immediately after the First World War. Closely associated with the growth of the English high street banks during this period was the Bank Clearing system which facilitated significantly the expansion of interbank transactions. In other words, cheques predominated over the use of coins, bank notes or bills of exchange (Pringle, 1973, 22). Not surprisingly, by 1900 ten clearing banks captured 46 per cent of total deposits in England and Wales and by the end of the First World War, five major clearing banks captured 97 per cent of total deposits (Holmes and Green, 1986, 121).

National retail branch networks eventually emerged for individual building societies. First for the Halifax in 1937, followed by Abbey National and the Woolwich in 1948, while the Co-operative Permanent Building Society came fourth in 1952 (Davies, 1981, 87-8). National networks of retail society branches were created more slowly and more organically than for high street banks. This reflected in the slow process of amalgamation amongst building societies: until 1825 there were at least 69 societies and their number grew steadily until 1895 when there were 3,642 of them (Jeremy, 1998, 299). Then their numbers started to fall as by 1900 there were only 2,226 (McKillop and Ferguson, 1993, 7). During the Second World War the number of building societies fell from 960 in 1938 to 890 in 1945 (Davies, 1981, 64; Cassell, 1984b, 56). This trend continued during the post-war period: between 1952 and 1979 the number of societies consolidated from 796 to 287 while the number of building society branches grew from 1,455 to 5,434 (Davies, 1981, 27 and 63). By 1992 the number of societies had fallen to 89 (McKillop and Ferguson, 1993, 7) and at the end of the financial year 2003

there were 63 building societies, two down on the number at the end of the previous year (Coles, 2004).

Consolidation saw the amalgamation of previously separate banks and building societies to create financial intermediaries which were not only larger in scale than hitherto but, as retail branching developed, also provided financial services to clients drawn from a larger area, thereby acquiring a customer base which was more widely distributed geographically and often economically more diversified.

## **4 - Mechanisation of Clearing Banks**

Clearly identifiable during the late nineteenth century and early twentieth century in the history of British banking was the development of systems required to control and co-ordinate the business of a financial company which was conducted by a growing number of banking offices, retail branches or outlets, directed and supervised from a central office, the bank's headquarter offices. There were two fundamental aspects shared by each and every system of bank control developed during this period: first, the establishment of clearly specified and supervised routines which determined the organisation and nature of day-to-day business and, second, the imposition of these established routines upon newly acquired, and previously independent, components of an acquiring bank. In the first case, the senior offices and directors of a bank would establish the strategic policy of the bank, to ensure control over lending and borrowing and establish the terms under which business would be undertaken and, then, they would ensure their control over the implementation of this strategy by insisting on adherence to closely specified practices and protocols. Several features of this management system which ensured central command of the bank's resources can be identified; these included: the provision and identification of premises which would provide the location of business, the stipulation of the hours during which a branch would be open for business, the creation of an internal labour market, which required the implementation of career structures and, most important of all, the designation of power and authority within a branch.

An essential feature of this system, designed to ensure direction of a retail branch remote from the central offices of a bank, was the establishment of universally applied accounting procedures which ensured both the observation and the direction of retail branch activity. Usually the direction and supervision of these managerial and accounting procedures were achieved by a strict insistence that the recording and transmission of information was undertaken according to a standardized format. For the senior offices of late nineteenth century banks in Britain, rapid and convenient access to comprehensive data which was accurate, recent, and recurrent was essential to the conduct of their management of the enterprise. If one manifestation of this was the growing collection of ledgers, each laid out to a specific and specified design to meet a particular purpose, held while in use by the branch and, later, on completion, by the head offices of each bank, another was the customised stationery designed to meet the requirements of communication internal and external to the bank. Additionally, the corresponding or equivalent records, which allowed the documentation of the progress of the whole enterprise, were constructed at the head office to allow both supervision and command of all the resources available. These systems, while obviously not perfect, were nevertheless highly successful in allowing both the observation and direction of ever growing financial institutions.

The first two decades of the twentieth century saw great changes in the equipping of bank offices as new technology, embodied in telephones, typewriters, pneumatic communication

tubes, photographic records, steel filing cabinets and electric lighting became more common. As one expert opined, 'It may nowadays be said, without exaggeration, that machines and devices exist for handling the routine side of almost every kind of clerical work involved in banking, from opening the envelopes in the morning mail to sealing them up and stamping them for the evening mail.' (Ellis, 1931c)

One such innovation was the adding machine which could undertake many essential but routine operations of basic arithmetic which were the norm for the overwhelming majority of operations undertaken in a bank. Within a year of Queen Victoria's death in 1901, on its introduction, the Burroughs Adding Machine was being used in British Banks for straight listing and casting but it was soon appreciated that this, and similar machines, provided an effective means to enter regular dividend payments, and then lists of entries and debits to customers' account provided. By the early 1920s the adding machine was well established as a standard item of equipment at the Big Five's head offices and in larger branches.

Of much greater significance for the determination of business strategy and bank organisation, was the introduction of accounting machines, which had the capacity to record and store operations. Ledger Posting Machines made possible the mechanisation of customer accounts, rendering them more legible, more accurate and more efficient than the pass books which had previously been the accepted technology (Anonymous, 1931). At the Midland Bank they were first introduced in the Overseas Branch, a discrete department within the bank, which facilitated trial (and error), in 1926 to produce the balances on accounts. The results of this experiment were sufficiently promising for the Midland to plan a programme for the introduction of Ledger Posting Machines throughout the bank. By the end of 1927 these machines had been further developed, by the addition of a Proof Strip or Tally Roll, which automatically recorded every item entered, so that the totals of debits and credits posted were recorded as were the new balances produced. An important feature of this facility was that it provided security in the form of an independent means of cross-checking the record of financial transactions (Rouse, 1930, 22).

This technology also facilitated the development of centralized records which recorded the financial position, exposure and recent history of the bank and its component parts. Furthermore, it provided significant cost savings, through the substitution of relative dear male labour by the relatively inexpensive combination of female labour and machines. While the significance and impact of machine banking is further developed below, it is important to note that its introduction was both earlier and more pervasive than is recognised in the literature which records this development: often the introduction of banking machinery is mentioned without reference to its broader significance for bank organisation (Ackrill and Hannah, 2001, 77-8), alternatively the introduction of banking machinery is dated erroneously from the end of the 1930s, the late 1940s or even the 1950s.

One example will suffice to demonstrate both the nature and maturity of this process. In 1931 J. Ellis, of Barclays Bank's Chief Foreign Branch contributed a three part article to *The Spread Eagle*, the bank's staff magazine, which is both interesting and revealing for a number of reasons. First, it provides a brief but competent description of the technology which had already been adopted and which now was being further diffused across Barclays branch network. Second, his contribution is well informed about technical and operational developments in banks overseas, especially in Germany and the United States of America, as well as at British banks, including Barclay's competitors on the English High Street (Ellis, 1931a, ; 1931b, ; 1931c). Third, and obviously linking to the vantage point from which he had

gained his second point, Ellis drew experience from his employment in the Chief Foreign Branch, a discrete, semi-autonomous section of Barclays Bank, which had extensive links with foreign banks, and one where the new machinery had already been successfully introduced. Fourthly, it is significant that the editorial preface to this survey reveals that senior staff Barclays, who would have admitted readily that it was a relative laggard in the adoption of this new technology, assumed that staff at the majority of their branches already had some acquaintance of the new technology.<sup>3</sup> Fifthly, and finally, his article demonstrates an informed and profound awareness of the implications of bank mechanization, defined broadly to encompass a full range of a clearing bank's operations. As Ellis wrote:

'The modern bank organiser does not buy machines merely because they are a novelty, or just surround himself with machinery. On the contrary, he works to a very definite and logical plan. He studies the transactions and material the bank – in the department or branch he is investigating – is called upon to handle, having regard to volume, frequency of "peak loads" and so forth. Thence he turns to the shape in which the results are desired. He must pay attention, also, to the various points to be covered in arriving at those results. All the while he keeps in mind the general lines of the bank's policy and the requirements and satisfaction of the *clientele*. These are the conditions under which he draws up his plan to provide the desired results as quickly, as economically and as efficiently as possible. Having made the outline of his plan, he next selects the machines and devices which, in his judgement, will best aid the staff in the consummation of the scheme.' (Ellis, 1931a, 405)

As early as 1931 a senior manager, in the bank which itself accepted that it was slowest in the 'Big Five' convoy en route to mechanization, was writing about this process employing such telling phrases as: 'the modern bank organiser', 'logical plan', 'general lines of the bank's policy', 'efficiently', 'consummation of the scheme' and so on.

In the late 1930s, after a brief pause when the depths of the international recession coincided with a period of consolidation, the 'Big Five' high street banks recommenced their drive to mechanised banking, with the threshold of branch size being set at smaller and smaller limits. Even in smaller branches, where mechanical banking was uneconomic, at least one of the Clearing Banks aimed at the extension of mechanization with the objective of achieving rationalisation and standardization. This process was brought to a sudden halt when Germany invaded Poland. The economic effects of the Second World War and its dire economic aftermath, both exacerbated by a stringent foreign exchange shortage, put a brake on further bank mechanization and this halt to further diffusion lasted until the existing technology was approaching the end of its effective lifespan.

The second further major transformations of technology in the banking sector, associated with electronic information technology, and especially computers, augmented these functions eventually with the capability to achieve distributed processing based on networks. However,

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<sup>3</sup> Ironically, the passing of the passbook, which was the most the obvious and frequently remarked upon manifestation of the introduction mechanical banking, with the introduction of loose leafed machined statements in the 1920s, proved to be much more resilient than then appeared to contemporaries. In the longer run, further technical progress ensured that a new and improved passbook would become the most significant financial instrument held by many customers of retail banks at the beginning of the twenty first century. Until this summer, transactions undertaken from a (British) National Savings account could be recorded in a passbook which could also be updated mechanically. Furthermore, on opening a bank account in Spain last year, one of the authors of this paper became immediately the possessor of machine-readable passbook, the direct descendent of the hand-written bank book, which permits direct on-line real-time access to his bank account.

while the adoption of computers has been associated with a growing complexity of banking services, with banks seeking profits through the provision of an increasingly wide range of financial services, the basic functions required of information systems by the banks have changed little. While the physical manifestations of systems which utilise information technology, highly visible as 'hole-in-the-wall' banking stations, cheque and credit cards, internet access to bank accounts and electronic financial transfers, have changed the public's perception of the delivery of bank services, a significant portion of the essential business conducted by banks closely resembles that of earlier periods. Furthermore, the problems associated with the efficient organisation of this core business are very similar in nature; amongst these can be included the retention of customer confidence, security of assets, record keeping, and so on.

## **4 - From Mechanisation to the Computerisation of Banks**

Although the 'Big Five' clearing banks had recognised the potential of 'mechanical banking' to overhaul management structures and introduce new systems of management control, computerisation in Britain borrowed from developments in North America. In the US, during the 1920s banks experienced a period of growth that continued in spite of the Great Depression although, unlike England, this growth was not reflected in the expansion of branch networks which were prohibited by law and US banks remained relatively small by British standards. An indicator of this growth of banking business was the increasing number of paper-based transactions, such as cheques being cleared, the figure reaching six billion annually by the mid-1920s.<sup>4</sup> 'The spectacular rise in cheque volume and activity, with no corresponding increase in the value of deposits, placed a severe strain on the banking system' (Yavitz, 1967, 11). Management of cheques became a critical problem as cheque clearing was expected to continue growing and this called for specialised mechanical aids. In the early 1950s, cheque clearing had long represented an important area of mechanisation of accounting functions. However, what the banks needed at this time was a cheque-reading machine.

Computer manufacturers were unwilling to invest in developing a system that would help in the proof reading and book-keeping of cheques (Yavitz, 1967, 20; McKenney and Fisher, 1993, 46). As a response, Bank of America, then the largest in the US with assets in excess of \$12,000,000,000 and 844 retail bank branches in 1963, approached the Stanford Research Institute (SRI) to design and eventually build a prototype that included the interconnection of tabulating machines, sorters, punch card readers and hybrid computing technology, that is, an application resulting from the combination of transistors, vacuum tubes and operational amplifiers. Developing the system, called Electronic Recording Machine - Accounting (ERMA), required some \$10 million dollars and three years of work, culminating with its launch in September 1955.

In spite of an apparent familiarity with technology by directors at Bank of America (given the close geographical location of its headquarters in San Francisco with Silicon Valley), engineers at SRI had to modify the bank's requirements for these expectations to fit what the technology could actually do (McKenney and Fisher, 1993, 48). As a result of the combination of business priorities with technological possibilities the ERMA only delivered a bookkeeping machine, primarily aimed to reduce labour costs.

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<sup>4</sup> Cortada (1993), p. 129 quoting W. H. Leffingwell *The Office Appliance Manual*, (New York, 1926), p. 180 and S. Ratner and others, *The Evolution of the American Economy* (New York, 1979), pp. 505-10. However according to Yavitz (1967), p. 11, approximately 1.5 billion cheques were cleared in 1939, and this volume increased to 6.5 billion in 1950 and to 13 billion in 1960.

In the early 1950s at least seven out of a 40 strong staff in one of Bank of America's retail bank branch were employed as full-time clerical workers (McKenney and Fisher, 1993, 44). The issue of labour costs in retail branches was made more acute by an exceedingly high turn-around rate amongst these young (aged between 18 and 24), female staff whose monotonous work mainly consisted in sorting pieces of paper, running an adding machine and bundling checks. Cheque clearing was thus a major concern for directors in spite of other banking services (such as consumer loans, mortgages and other lines of credit) becoming available to large parts of the population and adding to banks' paper-handling woes. Concerns with increased (and increasing) expenditure around cheque clearing were also fuelled by the top management of banks being unwilling (or unable) to price individual services in exchange for deposits at below market rates.

To no surprise, then, the development of the ERMA primarily addressed the way in which the Bank of America accounted for changes in the balance of current accounts and recorded the history of these transactions. There is little else that emerges as associated with this new system in terms of changes in organisational control or profitability of individual services. The ERMA, however, did allow current account book-keeping to be moved from retail bank branches to centralised locations (although for some banks this process was still on going in the 1980s)<sup>5</sup>. The ERMA was also instrumental in the Bank of America maintaining a lead in retail finance for over a decade and a half (McKenney *et al.*, 1997).

Developments around Bank of America's ERMA changed the banking industry in the US and elsewhere when other banks built around the ERMA's associated innovations (in particular, its patent for magnetic character recognition). This change took the form of a standard for cheque recognition as designed by the American Bankers Association (ABA). Between 1954 and 1960, the ABA shared results of internal consultation with major computer manufacturers and the Federal Reserve and these meetings were to establish guidelines specifying that a cheque should itself be a carrier of information for input into mechanical sorting (1955), through the use of magnetic-ink character recognition or MICR encoding (1956), based on Arabic numerals so as to be both man- and machine-readable (1958) and portraying standardised codes and symbols (1960) (Yavitz, 1967, 24-6).

In the UK, the clearing system had also represented an important area of mechanisation of accounting functions. An early history of mechanisation at the clearing house has yet to emerge, but the importance of mechanical aids to this process is undisputable. For instance, an Electronics Sub-Committee of the Committee of London Clearing Banks was set up in 1955. This was a major force in the process leading to automation, and was chaired and run by "Barclays men". Clearing banks such as Barclays and Martins pioneered efforts into the use of computers by opening dedicated centres for branch book-keeping (it actually took from 1961 to 1974 for Barclays to put all its retail bank branches 'on-line') and in 1967, Barclays was responsible for introduction of the first automatic teller machine (ATM) in the world (more below).

Clearing banks were also alert, early on, to developments around automation and the introduction of computer power into US banking. For instance, Mr. A. M. MacGregor, manager of the Midland Bank's Machine Department (significantly renamed Operations and Methods in 1961), visited the US in 1956 with the specific purpose of looking into the

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<sup>5</sup> See further Holmes and Green (1986), p. 248 and 303; Morris and Westbrook (1966), p. 45; Wood and Bätz-Lazo (1997), p. 35; Bätz-Lazo (2004), p. 10.

development of electronic bookkeeping methods and computers in banking (Anonymous, 1963). In postwar Britain Powers-Samas was the main supplier of accounting machinery to the clearing banks (Campbell-Kelly, 1989, 178). Although Powers-Samas had expertise in the development of devices to handle punched-cards, it recognised that the development of a cheque reader was beyond its resources. In response to this challenge, and in an attempt to remain a major force in the sector, the Chairman of Powers-Samas, Col. A.T. Maxwell, arranged a secret and historic meeting with BTM in 1956. This meeting resulted in the establishment of a joint working party to determine a strategy for a joint venture in bank mechanisation, an initiative which proved to be the first step towards a merger of the two companies to form ICT in 1959 (Campbell-Kelly, 1989, 99 and 178). By 1958, according to Townsend and Edwards BTM had developed, in conjunction with an American firm, a large-scale computer for use in banks and similar organisations (Edwards and Townsend, 1958, 83).

According to Channon, UK manufacturers had an incentive to enter the market for commercial applications because banks and other financial service organisations began to invest heavily in computers in the late 1950s and early 1960s (Channon, 1977, 45). Indeed, in 1959 Bank of Scotland installed an IBM 1401 and thus could challenge Barclay's claim to be the first UK clearing bank using a computer to handle accounting information (Saville, 1996, 805).

In 1960 Burroughs seized upon the purchase by Lloyds Bank of Burroughs B.101 Sorter-Reader to demonstrate the benefits of automation to other clearing banks and to building societies.<sup>6</sup> It organised demonstrations of the equipment for directors of other financial intermediaries who were also shown a US-produced film which illustrated the posting of accounts on the B.251 Visible Record Computer coupled with the B.101 Sorter-Reader and the P.700 Amount and Account Number Printer.

The B.101 Sorter-Reader was a high-speed digital sorter, primarily intended to be used by banks for sorting cheques and credit slips into branch and account number before posting. It read magnetised figures and sorted documents at approximately 1500 a minute, into 13 sections – 10 for the main digital sort, 2 for special items, 1 for rejects. The exhibition of the Burroughs' Sorter-Reader at these gatherings clearly indicates the sustained efforts made by US manufacturers to disseminate information about their technology in the UK. It also indicates that UK clearing banks, like their US counterparts, were anticipating an increased work load resulting from the projected huge increase in wage payments made by cheque and, moreover, the greatly increased number of personal accounts that would be opened.

The alternative to computers was an increase in the number of employees which, taken with increasing unionisation amongst bank workers and generally rising wages, implied a significant rise in costs. It is worth noting here that in the case of clearing banks and later on building societies, the adoption of new technology was closely associated with the recruitment of female bank clerks and their more proficient use of keyboards, similar to those on a typewriter, as well as significantly lower rates of compensation for women, led to the transformation of the bank as a working environment. There were other causes here, including relative rates of pay, changed social attitudes to women's work and the residual impact of recruitment of women in the Second World War that ensured that gender was a factor which influenced both the adoption of machine banking in the late 1920s and the post-1950 adoption of computers. But as had been the case of their US counterparts, UK banks were feeling the

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<sup>6</sup> Woolwich Equitable Building Society (hereafter WPBS), *Brief Report on Automation*, Barclays Group Archives, Manchester, 4 Apr. 1960, Ref. 144.

strain of high turnover of female clerical workers, particularly in London and Birmingham (Booth, 2004). In such circumstances, Channon argues that banks 'turned gratefully to computers, which could be used to handle routine business and increase the strained capacity of many small branches'(Channon, 1977, 45). Computerisation reduced costs and 'helped towards a slow but steady reduction in the number of branches' (Channon, 1977, 46).

Automation offered banks the potential of achieving improved levels of productivity but the adoption of data processing equipment was very price sensitive as they were expensive acquisitions. For instance, a B.101 Sorter-Reader machines was priced at £35,000; moreover, as it was 2 ft. long by 3'6" at its widest, 5 ft. high, weighed 4,000 lb. and were 'very noisy'<sup>7</sup>, housing the machine was expensive, often requiring the transformation of office space to accommodate it. A P.700 Amount and Account Number Printer, the machine used for embossing magnetic characters, cost £1,500 each. The investment in automation sky rocketed to over £100,000 if a bank decided to run the sorter together with a B.251 Visible Record Computer, a device that used magnetic characters to calculate debits and credits for each account, update the balance and generate a statement.

Local competitors to US-developed computer technology for commercial applications included Lyon's LEO. However, according to Hendry, 'whereas LEO II was sold to industry for general data processing, Pegasus II [Ferranti] was sold either as a scientific computer or to banks and insurance companies'(Hendry, 1987, 93).<sup>8</sup> Ferranti's Pegasus II had found users amongst financial service organisations, including Martins Bank.<sup>9</sup> Instead of using magnetic characters as with the Burroughs equipment, in the Ferranti machine all of the information fed into the computer was stored on perforated or magnetised tape and then stored in 'memory drums'. Statements of accounts and other information could thereafter be produced very speedily, as and when required. In spite of this apparent strength in servicing British financial service organisations, Ferranti's directors perceived there was an insufficient demand to justify substantial investments in production facilities or to continue with development of mainframe computers. As a family-owned firm, Ferranti was also going through a period of reduced liquidity and in the process of exploring overseas markets. In the computer market 'while faced with overwhelming American competition the window of opportunity proved so fleeting that there was little time to fashion elaborate expansion plans'(Wilson, 1998, 103). As a result, during the 1950s Ferranti let go of its lead in mainframe computers for general commercial use and focused most of its resources on defence sectors. In 1963, main frame computers were finally divested (Wilson, 1998, 102).

Meanwhile, in 1961 Barclays demonstrated the viability of the new computer technology by successfully introducing an EMIDEC 1100 to process the accounts of its Pall Mall district which operated 40,000 accounts. This was a first step in process of diffusion of computerisation throughout Barclays, a development not long delayed by the introduction of the over- ambitious scheme to mechanise all the bank's banking activities, with real-time working provided by a Burroughs 8500, simultaneous with the introduction of decimal currency in the United Kingdom (Ackrill and Hannah, 2001, 330-1). Although the careers of the senior managers involved were not damaged, a further demonstration of sound judgement on the bank's part concerning the nature of business strategy, the lesson provided by this

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<sup>7</sup> Unless otherwise stated, data on this paragraph comes from WEBS, *Brief Report on Automation*, 4 Apr. 1960, Ref. 144.

<sup>8</sup> Hendry (1987), p. 93, adds a cryptic reference, apparently to F.M. Fisher, J.W. McKie and R.B. Mancke, *IBM and the US Data Processing Industry: An Economic History* (New York, 1983).

<sup>9</sup> WEBS, *Brief Report on Automation*, 4 Apr. 1960, Ref. 144.

experiment was not lost on Barclays competitors. For British banks this was a rare example of a bold venture at the cutting edge of technological progress, and one which demonstrated the benefits of the alternative, and now vindicated, strategy of adopting quickly technology which was already tried and tested.

Further developments, in both the financial services offered and the information technology used to deliver these services, followed apace among all the major banks. Only a year later, the Westminster Bank, true to its tradition as an interwar tail-blazer, became in 1962 the first UK bank to provide its customers with cheques printed to include machine-readable information which enabled them to be sorted automatically. By this adoption of advanced, but not pioneering, information technology the Westminster Bank was able to further centralise those accounting functions which had remained at the branches. The pace of adoption, and the nature of the developments taking place in parallel in the banking industry, was demonstrated within twelve months when Coutts & Co, a private bank owned by the National Provincial Bank, another of the 'Big Five' English high street banks, adopted a fully computerised accounting system which encompassed all of its branches.<sup>10</sup> The adoption of a fully integrated system at Coutts also demonstrated well three other points: first, that bank size was not the only determinant of adoption of new technology, the private bank was but a fraction of the size of its parent; second, that the National Provincial, again continuing a tradition established in the 1920s, was able to trial new technology in a constituent bank, and, third, as Coutts was solely a London-based bank, that even in 1963 provision of a networked system was easier to achieve within a region than was the delivery of a comprehensive national service.

In summary, during the three decades that followed the Second World War, British banks began to plan for and implement the introduction of computers. This second stage of bank mechanization can be characterised as an evolutionary story of assessment, innovation, and diffusion, followed by reappraisal and further innovation.

## **5 - The Mechanisation of Building Societies**

Building societies (and particularly the largest in terms of total assets) followed clearing banks and manufacturing firms by introducing office equipment during the 1920s and later on punched card technology and tabulating machines during the 1930s and 1940s. Dissemination of office technology, however, was quite diverse amongst the building societies. The Co-operative Permanent Building Society (CPBS), for instance, did not purchase its first tabulating machines from BTM until 1944. These machines were purchased to enhance working conditions of senior staff at the Mortgage Department. In 1946, the devolution of individual account control to staff at retail branches took place and it was accompanied by the purchase of 12 additional adding and listing machines to support the growing network of branches and agents. However, the potential of these machines, as well as of punch-hole 'accounting' machines purchased in 1945, was not fully exploited until after 1951 when rent controls were lifted. It was then that increasing the size of the branch network and divesting itself of under-performing agents became more important for CPBS.

Like the Provincial Building Society and the N.A.L.G.O. Building Society, the CPBS used a combination of the Hollerith 80-column card system and electronic equipment to generate monthly ledgers. Hollerith cards were processed by electrical contacts whereas Powers-Samas'

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<sup>10</sup>[www.royalbankscot.co.uk/Group\\_Information/Memory\\_Bank/Our\\_History/Group\\_Constituent\\_Histories/coutts.htm](http://www.royalbankscot.co.uk/Group_Information/Memory_Bank/Our_History/Group_Constituent_Histories/coutts.htm)

machines processed cards by 'feeling' punches in relation to tiny roads. The Alliance Building Society, another of the largest ten societies, used electronic and punch card technology based on Powers-Samas machines. Mechanisation at the Alliance is a good example of how the initial introduction of calculating machines resulted in the substitution of manual clerical work for sorters and sorter readers to prepare monthly and daily ledgers.

In 1957 the Alliance was described as 'an experienced user of punched cards to generate monthly ledgers for individual retail branches.'<sup>11</sup> Forty-column cards (with separable mortgage accounting cards for cash, balances, monthly debits and annual insurance debits) were created from a combination of summary listings ('till sheets') and individual slips. Before processing, the cards were checked by a special team of clerical staff who confirmed that credits were mortgage repayments and debits had the correct account number and identifier.<sup>12</sup> Confirmation was necessary because a full listing of account numbers was not always available for staff at retail branches (but, following procedure, staff at the branch would add the address of the individual member in the credit or debit slip). Credits to a member's (i.e. customer's) account had to be matched to a cheque, deposit slip at a clearing bank or deposit slip at one of the society's retail branches.

Cards were then expected to pass at a rate of up to 6,000 per hour through each stage of the system, namely, conversion to punched card, tabulator, collator, calculator and posting transfer interpreter. Interest warrants would be printed on continuous stationary, which was imprinted first by the addressed system and subsequently by the Powers tabulator (who would also leave a trace through punched paper tape.) However, no interest was calculated exclusively by the tabulator. Interest for long-term deposits ('share interest') was calculated half-yearly by the branches and checked at head office ('Chief Office'). Mortgage balances were tabulated and sent to an outside advisory agency where the annual interest was calculated, noted on the card and the card returned to the society for the interest to be punched.

When the addresses had been printed on the forms, these were called over with a tabulation of current balance cards so that after this 'call-over' the balance cards were arranged in the same order as the addressed warrants. The addressed warrants were then fed into the machine with the cards and, automatically, the account number and capital and interest amounts were printed. The warrants were then checked and initialled, the checker's duties being limited to verification that the account numbers in the address section and the financial section agree. The Alliance had three mortgage payment dates: first, second and third Tuesdays in the month, and consequently three posting dates. All the cards for the same posting date were fed through the tabulator for posting at one time and there was a monthly arrears debit for every account.

The Alliance would run term deposits ('investments') and mortgages through different equipment. Burroughs equipment was initially used and then Powers-Samas introduced for both systems. The Powers equipment 'was custom-built and [was] not formed of interchangeable units.'<sup>13</sup> Changing to Powers-Samas required from six months to a year as well

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<sup>11</sup> WEBS, *Electronic Accounting*, c.1957 (Ref 1 The use of electronic and punched card accounting equipment by building societies).

<sup>12</sup> Instead of a "check digit" the Alliance used the first three letters of the borrower's or depositor's surname. This was deemed of great assistance to ensure that the cash card was married to the correct balance card before posting [WEBS, Visit to the Alliance Building Society's Punch Card Accounting Installation, 5 Apr 1957 (Ref 1 Practical points applicable to any punched card system)].

<sup>13</sup> WEBS, Visit to the Alliance Building Society's Punch Card Accounting Installation, 5 Apr 1957 (Ref 2 The change-over from Burroughs and benefits).

as having to train all but one of the operators (specific skills meant that the former Burroughs operators were either transferred to work elsewhere or left the society). Migration to the Powers-Samas system resulted in the Alliance handling 'twice as many accounts as they had when they changed from Burroughs, with the same staff. Postings [were] more easily kept up to date and statistical information [was] more readily available.'<sup>14</sup>

The approach of the Alliance to centralise all individual account information at head office in Brighton contrasted sharply with that at the Halifax, traditionally the biggest of all the building societies in terms of assets. The Halifax gave retail branches full responsibility for the contents of the account records and control of the administration of individual accounts (Anonymous, 1979, 2). The Halifax used Powers-Samas punched card equipment to summarise daily records of receipts and payments rather than for maintaining individual accounts. These records were analysed under various headings after being sent daily for processing to head office from each retail branch, thus permitting the General Ledger to be written up on a daily basis and showing the up-to-date financial position of the society.<sup>15</sup>

Dissemination of office technology not only differed as between the societies but also within the societies themselves. For instance, the clerical and bookkeeping effort needed to deal with increased business volume within the most active retail branches of the CPBS was alleviated when, in 1959, the society purchased three 'Sensimatic' Burroughs accounting machines (model F 203 ½ at a price of £1,595 each). These adding and ledger posting machines had part-manual and part-electronic features. They differed from previous models in that ledger sheets and statements could be posted simultaneously while the balance to be brought forward was stored in magnetic stripes on the reverse side of the ledger sheet (Anonymous, 1963, 432). The machines were to be located at the Nottingham, High Wycombe and Bradford offices (and later in Belfast) while smaller bookkeeping machines were then relocated from those offices to retail branches in Swindon, Northampton and Middlesborough which, at the time, still operated by hand.<sup>16</sup>

Practices at the CPBS, the Alliance and the Halifax suggest that the influence of early mechanisation in the form of calculating machines and batch processing offered a cheap and efficient way to simplify bookkeeping systems rather than developing methods by which to manage information. Simplifying bookkeeping through mechanisation, however, also associated with some disadvantages and these were going to become more significant by the 1970s.<sup>17</sup> These disadvantages included, firstly, account decentralisation, resulting in staff at retail branches having to deal with several listings for sufficient details to emerge and to build up-to-date information on an individual account. Secondly, because of postal delays, a branch could expect a four to five day 'turnaround' between the occurrence of the transaction and the reflection of the transaction in a centrally generated listing. Finally, data preparation tasks concentrated in a single location (eventually called Computer Centre) which eventually resulted in problems of staffing and space (which became critical for some societies in the early 1970s.)

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<sup>14</sup> WEBS, Visit to the Alliance Building Society's Punch Card Accounting Installation, 5 Apr 1957 (Ref 2 The change-over from Burroughs and benefits).

<sup>15</sup> WEBS, Electronic Accounting, c.1957 (Ref 1 The use of electronic and punched card accounting equipment by building societies).

<sup>16</sup> Co-operative Permanent Building Society (hereafter CPBS), Board Minutes, Nationwide Society Archives, Nationwide Building Society, Wellingborough, 25 Jun 1959 (Ref Accounting Machines).

<sup>17</sup> Unless otherwise stated, data on this paragraph borrows freely from Anonymous (1979), p. 2.

The main challenge for the utilisation of electronic equipment by building societies 'was to devise [administrative] procedures for it and to provide suitable input and output equipment.'<sup>18</sup> This problem of peripheral input and output devices was similar to that encountered by Simmons at Lyons in the 1950s. For the team at Lyons, the need to link the clerical systems of the company to the computer necessitated the overcoming of two problems: 'a hardware systems problem concerned with providing the appropriate input and output at the appropriate speed, and an engineering problem of converting from the decimal and sterling records of the office system to the binary form required by the computer and back again' (Hendry, 1987, 80). Solutions to these problems were not easily found, despite linking up with various organisations such as the Post Office, STC, Ferranti and BTM. Indeed, continuing problems with the peripheral input and output devices during 1952 meant that it was only in late 1952 that work started on programming the Bakery valuations and payroll jobs to run on the new equipment.

Another limitation for widespread adoption of office mechanisation, in spite of mortgage financing being perceived as entailing substantially higher administrative expenses than commercial loans (Yavitz, 1967, 13), was that the punched card technology of BTM and Powers-Samas offered limited storage possibilities. Developments in the late 1950s around electro-magnetic storage devices were attractive as these innovations offered more convenient input and output interfaces as well as the possibility to arrange account information in a variety of ways. Leo Computers Ltd. was readily recognised as the leading and most experienced manufacturer of the technology. However, in 1957, a price tag of £75,000 for a Leo II (including ancillary reading and printing equipment) resulted in some building societies keeping their lines of investigation open. Moreover, migration to a new system could be lengthy and quite dear. To little surprise directors of building societies wanted reassurance of the system's effectiveness:

'I think it may be agreed that we would not wish to keep our records by [electronic/electro magnetic means] until these [systems] have been in practical use on a wide scale for many years.'<sup>19</sup>

Up to the end of the 1950s, the performance of agents, retail branches and regional offices was measured by growth in size, such as the volume of mortgage and investment referrals, rather than efficiency or effectiveness (such as financial profitability or credit risk exposure). Financial performance of the retail branch network and individual retail branches was identified only when specifically commissioned by the Board or the Finance Committee. Treasury operations were simple, as funds were either in mortgages or invested in government securities and war bonds. However, as suggested in Table 1, directors of building societies could see a number of potential applications for electronic equipment (including general purpose computing technology).

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<sup>18</sup> WEBS, *Electronic Accounting*, c.1957 (Ref 2 Reasons for the use of punched cards in conjunction with electronic means of accounting).

<sup>19</sup> WEBS, *Electronic Accounting*, c.1957 (Ref 2 Reasons for the use of punched cards in conjunction with electronic means of accounting).

**Table 1: Data Susceptible to Application of Electronic Equipment (1960)**

<b>Investment Accounts: Shares and Deposits<sup>20</sup></b>	<b>Mortgages</b>																														
<p><u>Number of accounts (Actual)</u></p> <p>Share accounts 130,000</p> <p>Savings shares 6,000</p> <p>Deposits 30,000</p> <p><u>Number of postings (Monthly average)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;"><i>Receipts</i></th> <th style="text-align: center;"><i>Payments</i></th> </tr> </thead> <tbody> <tr> <td>Share accounts</td> <td style="text-align: center;">7,500</td> <td style="text-align: center;">3,500</td> </tr> <tr> <td>Savings shares</td> <td style="text-align: center;">6,000</td> <td style="text-align: center;">-</td> </tr> <tr> <td>Deposits</td> <td style="text-align: center;">3,000</td> <td style="text-align: center;">2,500</td> </tr> </tbody> </table> <p><u>Basis for interest calculation -</u></p> <p>Share accounts - Day to day interest of transactions</p> <p>Savings shares - Interest from the end of the month of deposit up to the beginning of the month of withdrawal. Monthly credit of interest to be received on every account.</p> <p>Deposits - Interest from the end of the month of deposit up to the beginning of the month of withdrawal.</p> <p><u>Preparation of interest warrants -</u> (Semi-annual interest paid or credited on June 30<sup>th</sup> and December 31<sup>st</sup>, based on transactions up to the previous month)</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;"><i>Num of half yearly transactions</i></th> </tr> </thead> <tbody> <tr> <td>Interest sent by warrant</td> <td style="text-align: center;">58,000</td> </tr> <tr> <td>Interest sent to banks</td> <td style="text-align: center;">39,000</td> </tr> <tr> <td>Compounded (i.e. added to capital)</td> <td style="text-align: center;">28,000</td> </tr> <tr> <td>Credited to deposit accounts</td> <td style="text-align: center;">3,000</td> </tr> </tbody> </table> <p><u>Notification to banks-</u></p> <p>One alphabetical run, according to name of "investor", sorted into banks, listed and sent to bank with covering cheque.</p>		<i>Receipts</i>	<i>Payments</i>	Share accounts	7,500	3,500	Savings shares	6,000	-	Deposits	3,000	2,500		<i>Num of half yearly transactions</i>	Interest sent by warrant	58,000	Interest sent to banks	39,000	Compounded (i.e. added to capital)	28,000	Credited to deposit accounts	3,000	<p><u>Number of accounts:</u> 110 accounts (requiring 18 alphabetical runs on a regional basis)</p> <p><u>Posting media</u> (Sources of original transactions)</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;"><i>Average of monthly mortgage repayments</i></th> </tr> </thead> <tbody> <tr> <td>Counters of retail branches</td> <td style="text-align: center;">18,000</td> </tr> <tr> <td>By post and through agents</td> <td style="text-align: center;">15,000</td> </tr> <tr> <td>From banks</td> <td style="text-align: center;">76,000</td> </tr> </tbody> </table> <p><u>Information required on ledger</u> (Arrears and correspondence)</p> <p>Debiting of advances</p> <p>Monthly posting of cash credits on all accounts</p> <p>Monthly notification to Arrears Department on accounts which were two months in overdue (average 4,500 in Dec 1959).</p> <p><u>Application of variable interest rate charges -</u> Mortgage deeds contained conditions for changes in rates. The majority of mortgages provided for a regular monthly repayment but there were some 6,500 "Endowment Plan" mortgages (i.e. fixed interest and endowment period payable at irregular intervals).</p> <p><u>Furnishing statements to borrowers -</u></p> <p>Interest is based on the balance at the beginning of the year. The majority of the accounts carry interest at one rate.</p> <p>Annual statement of capital balance (total debited during the year and notice of balance due/remaining).</p>		<i>Average of monthly mortgage repayments</i>	Counters of retail branches	18,000	By post and through agents	15,000	From banks	76,000
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<sup>20</sup> We have used demand deposits, savings accounts and term investments for deposits, savings shares and share investment accounts respectively.

**Table 1 - continued-**

<b>Investment Accounts: Shares and Deposits</b>	<b>Mortgages</b>						
<p><u>Furnishing data to Inland Revenue</u></p> <p>No income tax calculations were involved in the payment of interest. Under a special arrangement the society paid tax on behalf of long term depositors (i.e. "share investors").</p> <p>Details of a 30 per cent sample of individual account holders with balances of £1,000 or more and three per cent of all other accounts had to be sent in intervals of three to four years. Details included name, address, total investment balance and total interest credited per year.</p> <p><u>Channel</u> (work flow)</p>	<p><u>Furnishing data to Inland Revenue</u></p> <p>Notification of estimated interest for the coming year and actual interest debited for the previous year.</p> <p><u>Insurance</u> (Annual debit of fire insurance premiums)</p> <table data-bbox="799 817 1085 929"> <tr> <td>Lady Day</td> <td>55,000</td> </tr> <tr> <td>Midsummer</td> <td>17,500</td> </tr> <tr> <td>Christmas</td> <td>3,000</td> </tr> </table> <p><u>Channel</u></p> <p><u>Holiday debits</u></p>	Lady Day	55,000	Midsummer	17,500	Christmas	3,000
Lady Day	55,000						
Midsummer	17,500						
Christmas	3,000						

Source: Woolwich Equitable Building Society, *Brief Report on Automation*, c.1964

Data in Table 1 shows the monthly mortgage repayments as the largest item of accounting work. Most of these payments were received through deposits at clearing banks and thus, banks provided building societies with a 'posting medium which [was] sorted, listed and used for posting to the ledger account.'<sup>21</sup> For the convenience of both the bank and the society, these transactions were distributed amongst banks retail branches so that the sorting and listing would also be spread between several building society retail branches. Detailed information emerging from the Woolwich also shows that, in spite of having outsourced a number of paper-based transactions to clearing banks, the society's retail branches received on average around 2,500 paper-based transactions related to mortgage repayments (through a combination of transactions at the counter of the retail society branch, postal deposits, agent and clearing bank deposits). At the time, the Woolwich had 40 branches and 750 agents (of which only 100 remitted some form of business on a daily basis), however, 'larger branches might receive up to 8,000 mortgage [related transactions] per month.'<sup>22</sup>

The interaction between banks and building societies further suggests how, in spite of the system of accounting for deposits, term investments and mortgage payments being administratively more cumbersome than that for clearing cheques, building societies had a more 'relaxed' time frame in which to deal with their processes. Indeed, clearing banks in the UK had three to four days to credit or debit an account whereas building societies worked on monthly and semi-annual cycles.

<sup>21</sup> WEBS, Data Relevant to Utilisation of Electronic Equipment, 28 January 1960 (Ref 3 Sources of Entry).

<sup>22</sup> WEBS, Data Relevant to Utilisation of Electronic Equipment, 28 January 1960 (Ref 3 Sources of Entry).

Conscious and sustained efforts at data gathering has revealed attempts by functional managers and directors of building societies to improve administrative processes and financial accounting procedures inside individual societies. For instance, in 1960, managers at the Woolwich speculated on the possibility of issuing an annual, full statement of all debits and credits to an account, rather than rely on the use of passbooks and summary listings. Moreover, managers and directors also speculated on how 'to provide, in one operation, means of reconciling cash for the cashier, a receipt or passbook entry for the member (preferably the latter) and a posting medium for the accounting system.'<sup>23</sup>

In the realms of management, however, there is some evidence of the use of accounting information for control and evaluation purposes. In 1962, the CPBS began to produce quarterly financial information statistics by which to evaluate the performance of its 112 retail branches. For building societies, the branch network (rather than agency contracts) was quickly turning into the main point of contact with retail customers<sup>24</sup>, and the growth in their number increased the need for effective managerial control. Quarterly financial information reports initially distinguished annual performance according to the permanence of individual retail branches in the network, while tracking the number and value of mortgage accounts that were opened by each retail branch. The emergence of these reports was significant because they established, for the first time, a regular discussion amongst top management as to why some branches performed less favourably than others. Top management was then able to comment on the potential benefits of alternative sources of information by which to assess the society's growth in previously unexplored cities or to intensify the society's representation where business had already developed.<sup>25</sup>

Quarterly financial information reports were the key to the management of the CPBS's retail branch growth when the society moved forward and expanded again after 1965. At the time, staff at the society already numbered 1,200 persons and the development programme listed over 100 towns where new branches were considered viable. By 1967 the reporting system provided consolidated information about withdrawals and gross investment receipts emerging from the 124 strong network. Factors which could result in some retail branches (or even regions) performing better than others included the influence of the overall economic environment, individual branch location (including type of business centre and position within the 'high street') and other features unique to individual premises (such as rent characteristics or use of the society's own dwelling). Comparative analysis of individual branch performance then started to consider not only whether to open new branches but also whether to direct marketing budget appropriation to branches in most need of refitting or relocation.

Computer manufacturers fought hard to position their products but the superiority of US-based technology was ever more apparent. Similar to the case of the clearing banks, building societies informed the Board of developments in computer technology by sending directors to visit computer manufacturers in the US as well as explore developments in US-based savings and loans institutions (Redden, 1986, 86; Ritchie, 1998, 88). At the Woolwich, for instance, the search to invest £200,000 in computer equipment included a consideration of the potential for a tailor-made system, in particular the adaptation of STC's Stantec Zebra transistorised computer

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<sup>23</sup> WEBS, Data Relevant to Utilisation of Electronic Equipment, 28 January 1960 (Ref 3 Sources of Entry).

<sup>24</sup> In 1962, under a strategy that halted asset growth while aiming to receive advances from the Treasury under the House Purchase and Housing Act of 1959, CPBS cut its ties with half of its 2,500 agents.

<sup>25</sup> CPBS, Notes to the Minutes of the Board, 31 Jan 1963.

with paper tape reader and Creed 1000 printer.<sup>26</sup> The Woolwich, however, also considered machines from companies at the forefront of computer technology such as NCR, ICT (Hollerith-Powers) and IBM. Meanwhile, in 1964, the Board of the CPBS was introduced to the workings of IBM's System 360 equipment.<sup>27</sup> This prompted the General Manager, Joseph Henry Simpson, to appoint a Computer Manager and a Senior Programming Assistant. The new manager would head the newly created Computer Department (which replaced the Operations and Methods Department) and:

'... had to be experienced in the Building Society work and, in particular, to have a thorough knowledge of the Society's methods and administration procedures. He (sic) would also be required to attend courses in computer programming and other operations in order to carry the project through to installation.'<sup>28</sup>

As had been the case in US retail finance (Yavitz, 1967, 38), the decision of building societies to automate via the use of a computer was based on perceived cost-savings and a technological frame of reference that viewed the computer as a high-output paper processing machine. According to Yavitz, the most important factor in evaluating the savings potential of a proposed computer installation in banking was the anticipated payback period, that is, the number of years of cumulative cost savings required to pay back the initial implementation cost (Yavitz, 1967, 46). Payback was used as an indication of the effectiveness of the investment in new technology and Yavitz estimated payback periods in US banking during the mid-1960s ranging from one and half to eight years, with a 3.3 year average and a three and a half year median. At the CPBS, however, it was estimated that capital costs and revenue expenditure would be compensated by savings emerging from automation over a period of 12 years but only if the society double its size and reached £1,000 million in total assets by 1976 (that is, at the end of the 12 year period).<sup>29</sup>

Clearly, the most significant result of introducing programmable computing power was the substitution of high-speed equipment for manual clerical work and slower-speed calculating machines. The effects of computers were to be felt in retail branches. For instance, the Abbey National used the installation of a Honeywell 400 in 1963 to help eliminate hand written passbooks by substituting them with computer pre-prepared record slips. Having paper-based slips directly routed to Lombard street would save a considerable amount of work at the retail branches.<sup>30</sup> It also had the advantage, for the society, of increasing the volume of funds cleared into an interest bearing account, since cleared funds could be invested two days earlier than had been the case prior to the adoption of computer technology.

The gains from the introduction of computers at head office included:

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<sup>26</sup> The Chairman of the Woolwich was also Chairman of STC and, not surprisingly, pushed the former to link up with STC but, in the end, the Woolwich's Accountant and STC's engineers recommended against it.

<sup>27</sup> CPBS, Special Policy Board Meeting: Electronic Data Processing, 16 Apr 1964.

<sup>28</sup> CPBS, Minutes of the Board, 7 May 1964 (Ref Computer Manager).

<sup>29</sup> CPBS, Special Policy Board Meeting: Electronic Data Processing, 16 April 1964 (Ref. 296.e Economics of E.D.P.)

<sup>30</sup> The Woolwich estimated that in November/December of 1959, 1/3 of borrowers used bank orders and 1/6 credit transfers to pay their subscriptions. As a result half the number of payments accrued to bank-based transactions. The other half was made out of transactions at retail counters or by post (1/3) and through agents (1/6). WEBS, The Effect of a Computer, 13 Mar 1964 (Ref. Borrowers).

- The elimination of strain and extra work caused by peak loads associated with borrower's annual statements, investor's warrants and statements, clearing returned interest warrants and changing interest rates.
- The possibility of exchanging magnetic tapes with clearing banks, which included details of mortgage credits that could be fed directly to the building society's computer.
- Much quicker turn around of mail, particularly with reference to the computer calculating redemption quotations and investment valuations for withdrawal.
- More flexible administrative systems. In particular with regards to arrears and the control of information at head office:

It was acknowledged that the reasons put forward for adopting E.D.P. [Electronic Data Processing] were similar to those which could be stated in considering the case for centralisation of accounts. The important aspect to be borne in mind, however, was that centralisation, other than on a computer system, would be impractical at this stage of the Society development.

It is perhaps inevitable that there would be some loss of personal service to members but Management expressed the view that this was not likely to have any material effect on the development of the Society.<sup>31</sup>

Greater efficiency associated with automation suggested that managers and directors of building societies faced an apparent paradox: on the one hand, greater efficiency through automation would result in greater centralisation. On the other hand, enhanced service offerings to customers associated with devolution of discretion to customer-facing-staff at retail branches and implying greater decentralisation. Senior managers decided for greater automation (in the form of newly introduced electronic and programmable computers) and improved communications, such as automatic internal switchboards. Automation resulted in the establishment of central accounting units and in the centralisation of customer account control so that regional and branch managers eventually lost autonomy to centralised senior managers. For instance, the central accounting unit of the CPBS was established in the summer of 1966 in Chesterfield House and within a few months the first batch of the society's retail branches was using computer-style accounting numbers for all new businesses. A practice that was, shortly after, extended to all of the 124 retail branches (Cassell, 1984a, 86).

## **6 - Summary and Conclusions**

For more than a century English banks and building societies have experienced a consistent process of change which has altered their nature, size and structure - they have also been the location of significant technological change. This process embraced both new machines and improved organizational methods. There is evidence that, when applying new technologies banking practices, senior managers of clearing banks and building societies consistently engaged in a systematic process of assessment of the potential for additional profit, or reduce cost. There are obvious signs that economic considerations determined both the decision to adopt or reject new technology and, when adoption was chosen, the selection of the preferred technology. Although managerial style in the financial sectors was often regarded by the public as somewhat and cautious, if not 'conservative', the financial companies reviewed here tended to quietly play the role of pioneers in the application of new information technology. However,

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<sup>31</sup> CPBS, Special Policy Board Meeting: Electronic Data Processing, 16 Apr 1964 (Ref. 296.b Centralisation of Accounts - Service to Members).

their public positions were strongly influenced by the perceived need to maintain the intermediaries' reputation and an image of 'stability'. Lyons apart, which had its own agenda in the development of information technology for the reformation of its business practices, it was the financial intermediaries that pulled computer manufactures into the business application market. At the same time, senior managers of clearing banks and building societies learnt early on there was little competitive advantage in adopting the latest technology as opposed to adopting the most effective technology. For instance, the more rapid computerisation of retail financial services was hindered by the limited storage capabilities of the technology available at the time, rather than by additional costs. Hence, UK clearing banks and building societies had very specific problems and adopted particular responses given then technology that was available at the time.

Finally, it appears that the story of automation in UK retail finance seems to have much in common with similar developments in the financial sectors experienced in other developed countries, particularly those in the US and Europe. However, work still remains to be done that will identify similarities and differences with other countries, particularly Asia and the developing world.

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