

The development of accounting machines in French banks from the 1920s to the 1960s

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Abstract

French banks faced severe organisational problems in the 1910s and 1920s when the scale of their operations grew dramatically as a result of the broadening of the customer base among personal investors and of the boom in discount activities, both of which required increased levels of bookkeeping. In the meanwhile, due to inflation and trade-union pressure, wages had increased. This led to French banks adopting a strategy of sharing information with German banks, which already seem to have developed the process of mechanising bookkeeping operations. Knowledge exchanges were set up with German (and Belgian) bankers so as to accelerate the transfer of organisation (re-engineering) skills and data-processing. Banks in the Alsace region were pioneers in this movement; but several big banks did not wait long before introducing a policy of investing in machines and new platforms for tackling dataprocessing. The 1920s and the 1930s thus represent a key stage in the transformation of French banks into actual service ‘organisations’.

Keywords: Banks; firms’ organisation; accounting machines; data processing; computer history; services

Introduction

The history of banking has been confined mostly to a reconstitution of the strategic activities and the knowledge-base of banks in the fields of credit, garnering deposits or managing assets, and financial techniques. Little, however, is known about the

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managerial organisation of banks, be it in respect of the management of human resources, the management of real-estate or the management of payment methods and the flow of money. Existing studies of the history of the French banking system (Bonin, 1987a,b, 1991, 2000a, 2001, 2002a,b, 2004a,b) have only dealt with certain aspects of the social and property management methods of some Paris-based, and regional firms, without placing the history of such 'organisations' at the heart of the matter. And yet, during the twentieth century, the large French banking firms began to develop the trappings of modern capitalist industry which are a common feature of banks in the twenty-first century. The strong capitalistic features of the large banking firms have become today one of the key factors in respect of their cost of financial mediation, their operational costs, their policies for productivity growth with regard to financial management criteria and to the famous 'return on investment'.

This development, however, has occurred in bursts as, for example, during the evolution of the 'banks of the masses' in the years between 1960 and 1980, and during the revolutions which have brought about the 'market bank' and transnationalisation since the 1980s. Each of these stages in the history of banking has imposed on banks a massive increase in their 'paperwork', and also constituted a decisive 'moment' in the history of the technical management of banks. Thus, in the period 1960–70, there occurred a revolution in business and administrative data-processing, with the development of large computer complexes, followed in the 1980s by the advent of networking, micro-computers and digitisation, which transformed banks into massive, networked systems and placed them at the very heart of the Information Technology revolution.

Technological revolutions in banking, however, have not been confined to the end of the twentieth century. During the first third of the twentieth century, for example, banking experienced such a revolution when banks first started to become large-scale enterprises. In particular, the development of the network of deposit and financing banks led to a restructuring at the very basic level of the enterprise itself: it required that data be managed and circulated on a national or international, rather than local or regional, scale. This meant the setting up of possibly an international or, at the least, a national network of retail bank branches, whose operations needed to be supervised with a view to the control and processing of data for accounting purposes. It is in this way that there developed accounting practices allied to management which form a 'prehistory' to computerisation in banks, an era of mechanisation ushered in by the use of electronic-accounting machines. Thus, our aim here will be to set forth in detail some of the stages of this growth, to present a chronology of events particular to the French banking system and to determine the levers which set in motion these processes of organisational change. Though this will facilitate comparisons with studies of other countries, more importantly it will shed light on the history of the service industries. In particular, the study will throw light on the ways in which banks restructured their organisations in order to facilitate and expedite data-processing, to improve the management of data within the framework of the banking system, to improve the analysis of risks and profitability and, finally, the reduction of operating costs.

This article proceeds in the following manner. The next section reviews the rise in the cost of managing paper-based systems on the back of an increased volume of transactions, with particular attention paid to the 1890–1918 period. The second section

considers the emergence of a community of specialists around mechanisation in banking organisations (1910–30). The third section discusses the influence of early adopters of mechanisation in Germany and the Benelux countries on automation within French banking (1925–35). Section four portrays the ‘coming of age’ of mechanisation up to the introduction of electronic computers in French banks (1935–60). The final section offers tentative conclusions and points to potential areas of future research.

The awareness of the need to re-organise the banking business

During the first third of the twentieth century, the French banking system was still made up of several thousand small businesses, numerous ‘local banks’ in regional townships and many small and medium sized family enterprises in the large provinces and in Paris (in this last case were to be found the *Haute Banque* houses, i.e., merchant banks). At that time, as Balzac, Stendhal, Zola and Mirbeau have described, banking depended on ‘paperwork’: massive registers, the Ledger (to determine monthly positions) and the Book of Account (for monitoring day-to-day transactions). But the explosion in the number of deposit banks and networked banks following the upsurge of ‘modern banks’ between the 1860s and 1900s markedly increased the client base, which came to include the middle-class, who not only came to use the banks for depositing cash, but also for the safe-keeping of securities. Thus, at the beginning of the twentieth century, the big banks established in Paris and equipped with branch networks each had several hundred thousands clients but, a short while later, this figure, for some of them, had grown into millions.

As a matter of routine, the banks had to keep customer ledgers, securities ledgers, etc. But the nature of banking was changing. In spite of an increase in overdrawn accounts, there developed a rise in discount activity, which began to enter into the heart of client business within France, just as it had abroad. This development led to a surge in discount banks, brought about a revolution in the role of the ‘commercial bank’ and, moreover, had accounting implications. Keeping track of the value of any discount, recording the discount list, monitoring expiry dates, recovering debts, etc. resulted in an enormous increase in the workload. As in other countries, the growth in the issue and transfer of shares and of investment in foreign securities gave rise to the primary and secondary securities markets: this necessitated banks in catering for stock-exchange orders, maintaining share-accounts for their investing clients, providing security related services for businesses, etc. Just managing its share-accounts meant that *Crédit lyonnais* had to process 150 million coupons in 1936 compared to 85 million in 1913. All of this led to a great increase in the ‘paperwork’, piles of legal, commercial and accounting documents on the one hand and, on the other, the registers in which to record the flow and positions relating to these documents. It must also be kept in mind that, for security reasons, both legal and accounting, banks had to keep two separate accounts for their clients, a record of the ‘position’ and a record of the ‘account’: the first being the routine account required to follow the client file and the second being the official account of the branch and the bank.

The banks thus had to set up massive service operations where employees recorded the entries, filed the documents and processed transactions. Mostly, large offices in the

big cities had their own small recording and processing set-up, comprising some scores of employees. On the other hand, the Head Offices of these banks, at the regional level or in Paris, would have massive centres with hundreds of workers dedicated to these administrative and accounting tasks (Bonin, 1996, 2000b). At the heart of every banking enterprise, the Portfolio service (for processing commercial paper), the Stock-Exchange service (for processing the flow of shares and securities) and the Accounts service (which itself was further divided into smaller departments) among others, gave rise to as many mini-organisations. This, in turn, led to a rational restructuring of these tasks so as to speed up the processing of transactions and to bring about a greater reliability in account-keeping: any little error would surface, at the end of the week or the month, in discrepancies between the various administrative and accounting records when checking occurred through the confrontation of the figures constituted on each side of managing departments.

From the 1890s, the mass employment of female workers, who represented a readily available 'workforce' and were, generally speaking, docile recruits who were paid less than their male colleagues, had enabled a substantial reduction in costs to be realised. Similar cost reductions were effected through the restructuring, 'concentration' and 'controlling' of the work of the data processing services, which involved the organisation of several scores or even hundreds of employees in an ordered and rational structure, the implementation of strict rules of discipline and rhythm, and the establishment of a hierarchy (by means of 'principal employees', 'heads' and 'service sub-heads') which helped in the verification process. In contrast to the employment of women, these developments relied upon the knowledge base of newly appointed bank employees being developed in-house.

On the other hand, this organisational development very soon came up against 'decreasing returns to scale'. There was a massive escalation in the size of this 'tertiary sector' which, in turn, meant either a reduction in the quality of the verification process or, in order to prevent this, an increase in the number of surveillance personnel needed, in the same way that Taylorism required foremen. While this led to an increase in the social status of thousands of employees involved in surveillance duties, for the banks it also meant additional salary costs, which increased appreciably due to a number of major factors: the contractual certification of female workers as permanent employees (the majority of whom had previously been only 'temporary', earning daily wages); the widening rift between salaries and prices (from the 1910s through the First World War and the inflation of 1920s), which led to important wage increases; and the formation of unions and the resultant strikes (most notably those of 1923 and 1925).

It was, in fact, this 'mass effect', with thousands of employees engaged in repetitive tasks, and who, in effect, formed micro-communities open to incessant wage demands, that was partly responsible for the introduction of machines to do the work: 'The Board is considering the acquisition of a number of Burroughs machines for 430,000 francs. These machines would replace a certain number of employees and would pay for themselves by the equivalent of some 14 months' salaries'.¹ At *Crédit du Nord* (a medium sized bank in Lille), it was noted that 'the manpower could again be reduced by 12 per cent due to a greater utilisation of machines and by further improving the work process'.² It was determined that '*Crédit du Nord* will install

25 accounting machines for 665,000 francs which will permit a reduction of 80 jobs. The cost of these machines will thus be recovered in a year and a half.³

Even so, it would be difficult to apprehend this mechanisation ‘wave’ if we were to ignore the ‘tsunami’ of streamlining that swept over the banking establishment. A whole gamut of changes went into the reformation of the organisation of the business of banking, and it is fitting that the word ‘organisation’ should be used to describe this, indicating parallels with ideas regarding the scientific organisation of work which prevailed in industry at this time. Thus, in 1930, Parisian bankers created the Permanent Committee on Banking Organisation (*Comité permanent d’organisation bancaire*), which in 1945, became the Committee for the Study of the Methods and Standardisation of Banks (*Comité d’études techniques et de normalisation bancaires*). Every large bank had its own department, the task of which was to look into the nature of its ‘organisation’. Société générale created its own organisational committee in October 1929, which then introduced a number of streamlining procedures throughout the 1930s, a process which was mirrored closely by Crédit lyonnais. No mechanisation would have been possible without this push towards a ‘standardisation’ of bank documents, i.e., of the statements detailing the movement of every transaction, of the account books and ledgers, of the client information forms, etc. The objective was to manage the overflowing paperwork by streamlining the bookkeeping (Hodder, 1934).

The move to new technological tools

We can, therefore, well understand why, henceforth, the banks would readily open themselves to any technological innovations which would enhance their economies of scale. A first priority was the streamlining of documents and records (format, presentation, etc.), along with their standardisation at the level of the business as a whole. The introduction of the carbon copy that enabled the duplication several times over of documents, which hitherto had to be laboriously recopied (e.g. for the branch or operational office, for the data recording section, for the transaction supervising department), occurred extensively. Without really being too original compared to the general technological progress of those decades, the banks began to mechanise data input. They had recourse to machines which would record names and figures, for example, for the current accounts of customers and for their own accounts. These tabulating machines could accommodate multiple columns of figures in wide format. They began to appear towards the middle of the 1920s, with the substantial increase in the capacity of punched cards (which up till then could take only 90 characters).

A community experienced in mechanical engineering

During the course of the First World War there emerged a European, or rather, due to the strong presence in Europe of American companies such as Remington Rand⁴ and IBM, a transatlantic, technological community.⁵ These companies quickly established commercial survey networks. However, the adoption of innovative technologies was

more due to a pan-European network of specialists actively involved in the banking sector. These re-organisers, or 'streamliners', met regularly at conferences and meetings in which information flowed freely. The advertisements issued by the machine manufacturers demonstrated the innovations: these specialists could then discuss among themselves the best ways of incorporating these machines into their organisation and the changes to be implemented in the work process. In fact, mechanisation by itself would hardly have worked had it not been accompanied and supported by a re-organisation of the data processing methods, a streamlining of the data flow and a standardisation in the presentation of such data. The vocabulary used in industry at the same time in relation to Taylorisation, Fordism and the streamlining of the work process, also found an echo in the banking world, just as it did throughout the service sector and amongst the accounting profession.

It appears that these new technologies were first and most often implemented in Germany. Due in no small measure to the quality of precision engineering attained in that country and the size of the market, office automation was widespread, either by a process of technology transfer from America or as a result of local innovations. Thus, Powers machines made major inroads into German banks (Diskonto, Dresdner and Reichsbank) in the 1920s, while Bull cornered the market in Darmstädter. These enterprises gained a large body of experience which then proved to be a rich breeding ground for their European colleagues. There was, for example, in the late 1920s, the publication of *La "rationalisation" des banques en Allemagne (The "streamlining" of German banks)* (Le Montréer, 1928) and a lecture, in Paris, by a director of the Dresdner Bank in 1930 (Rambow, 1930). This lecture was accompanied by the projection of a documentary film on the mechanised services of this German bank and, during 1930, the film was also screened at Nancy, Lille, Lyons and Marseille. Thus, during 1930, the secret functioning of this range of calculating machines was revealed throughout the four corners of France (*Banque*, December 1930: 853).

The French, in turn, increased the number of visits made abroad in order to evaluate the possibilities offered by streamlining and mechanisation. Thus, in May 1923, two executives of CCF (Crédit commercial de France) made a trip to Rotterdamsche Bankvereinigung in Amsterdam:

in order to better acquaint themselves with the new systems which had been implemented in its accounting division and which consisted of a large number of ingenious machines which could handle large numbers of bookkeeping vouchers and even correspondence with great rapidity. This system allowed it to reduce the number of its employees by a third, from 1,500 to 1,000, even though the workload had increased a little. At the same time, accounting errors, which stood at 1.5% to 2% in the old system, fell to 1%.

(Record of proceedings of board of directors of CCF, 25 May 1923, CCF archives)

In general, the Bankers' Association (*Union syndicale des banquiers*) undertook numerous foreign visits. The first took place in October 1930, with a visit to two banks: the Bank of Brussels on the ninth and Dresdner Bank in Berlin on the tenth. A second trip was made between the 12 and 17 October 1931 with a visit to Brussels (the Bank of Brussels, Société générale de Belgique and Caisse générale de reports et de depots), and then on to Amsterdam (Nederlandsche Handel and

Incasso-Bank) before a final trip was made to banks in London (Midland Bank and Westminster Foreign Bank). Thus, during the 1920s and 1930s a whole network of technological innovators and streamliners sprang up across Europe and helped form a body of ‘bank engineers’.

The rise of the French streamliners

The contacts formed throughout the rest of Europe and the work of machinery manufacturers stimulated Parisian bankers. An automation committee was formed within the Permanent Committee on Banking Organisation, which led bankers into discussing the management of operating costs. Regular discussions were held regarding technological progress and the practicability of new techniques. This facilitated the transfer of new technologies and the sharing of the lessons learnt from the first trials in reorganisation and mechanisation. Alfred Pose, a director of Sogénal, a bank in Alsace which was the subsidiary of Société générale in Strasbourg, became one of the French specialists of the scientific organisation of work in banks. Pose, an engineer with novel ideas regarding the reorganisation of business, was one of the promoters of the ideas of Henri Fayol. The scientific organisation of work fever, though, had caught on almost everywhere and encouraged specialists to envisage ever more efficient ways of reorganising the service sector. Such specialists, like Marius Dujardin, who began with the shares service in Crédit lyonnais in the 1920s, were pioneers. Similarly, in January 1927, Société générale recruited Joseph Boyé, an ‘in-house engineer’ who, through till June 1934, was in charge of ‘mechanical and electrical installations in the central buildings’ and who oversaw the implementation of the machines.⁶

In a more general fashion, between 1928 and 1931, the monthly review *Banque*, published by an editor who was close to the big Paris banks, turned into an instrument for the popularisation of techniques dealing with the streamlining and mechanisation of banking. ‘Streamlining specialists’, who conducted courses in special schools oriented towards the training of employees who wanted to climb the corporate ladder, also contributed and shared their experiences within *Banque*’s pages (see, for example, Berthau, 1928; Pineau, 1928). The review’s director and editor-in-chief even went on a series of lectures throughout the country: through December 1928 to January 1929, he spoke in 13 towns on ‘Streamlining and banks’ to underline the importance and usefulness of ‘calculating and accounting machines’ which, in those days, consisted of punching and tabulating machines and sorters. *Banque* also organised a significant event under the heading, ‘Bank and stock-exchange week’, which brought together bank officials, technicians and streamlining specialists under the aegis of a ‘Banking Organisation Congress’. This was held for the first time in September 1928, with a second congress following in October 1929.

At these first two congresses, the mechanisation and reorganisation of banks was made the central theme, with the presentation of numerous case studies, three lectures on the German, Belgian and American experiences and numerous presentations. The third Congress, in October 1930, was marked by the participation of many big banking houses, e.g., Banque de France, Comptoir national d’escompte de Paris (CNEP), Banque nationale de crédit and Banque de l’union parisienne. The fifth congress,

held in 1932, was divided into two parts: after a conference in Paris on 22 and 23 October, with a 'Salon of new accounting machines and organisational material', the participants travelled to a centre of such innovations, Mulhouse in Alsace, where they visited a major branch of Sogéna (*Banque*, 1932). Throughout the first half of the 1930s, *Banque* continued its efforts to encourage the mechanisation and streamlining of the banking system (Géry, 1932) and, as in the Anglo-Saxon countries, books on this technical subject were also published (Noury-Adil, 1932).

The implementation of a new form of management in banking establishments

Within our systematic unfolding of this technological and organisational evolution, it is about time that we identified the precise stages in the spread of these innovations within French banks. In fact, due to the large scale of their actuarial calculations, insurance companies were well ahead of banks in the integration of a mechanised accounting system (Yates, 1993). At the same time, the movement towards modernisation grew rapidly in banking firms. Without going too deep into the technological history, we can say that, in the first half of the 1920s, they already used tabulators made by Powers which added and edited partial totals, chain-linked operations and punched result cards. At the Société générale's coupon service, a double Burroughs machine generated complete statements thanks to its typing and calculation keyboards. These tabulating machines could also print (from 1925 in the case of Powers and from 1931 for the IBM) as they took in data either from pre-printed forms or printed them themselves. After 1922, the Powers systems were distributed in France mainly by Samas (allied to Powers UK)⁷ which had its own assembly shop in the suburbs of Paris. On the other hand, IBM entered the market via the International Time Recording Company (Vernay, 1989; Bashe *et al.*, 1986). Société générale itself decided to help Samas to become a French corporation in November 1935, and one of its own directors, Henry Poirier, was appointed its president.

Alsace-Lorraine: a pioneering centre?

We have been able to identify three pioneering firms in Alsace-Lorraine which began the restructuring and re-organising of their enterprises a couple of years before their competitors. They were fortunate in their geographic location as the winds of German technological culture from across the Rhine played a significant part. Due in large part to the efforts of Georges Vieillard, a graduate of the École polytechnique and an engineering consultant, Banque d'Alsace-Lorraine (BAL)⁸ at Nancy, which was then very active throughout the north-east of France, took to mechanisation in a big way between 1928 and 1931. Vieillard introduced a system of processing the accounts of segregated securities by means of punched cards and the client accounts were processed by typing machines equipped with counters;⁹ Powers machines were installed. All these reforms were inspired by innovations already developed in banks across Belgium and Holland. In 1929 and 1930, two directors of BAL were invited to

conferences in Paris (Birckel, 1930)¹⁰ to introduce, together with a documentary film, these innovations to their colleagues. In October 1930, the Banking Organisation Congress arranged a special trip to the Parisian headquarters of BAL because, ‘BAL is the only French banking establishment which makes such a great use of the Powers systems’ (*Banque*, 1930). But BAL’s bankruptcy put an end to this movement, while Vieillard himself turned into a strategic investor for Bull and introduced the manufacture of tabulators (Darrieulat, 1990; Daumas, 1979). Automation progressed with equal vigour at another bank in Nancy, Renault; indeed, in March 1928, its director, Ferrand, was invited to address trainee bankers attending the *École spéciale de préparation aux banques* at the Sorbonne (Ferrand, 1928) and the Banking Organisation Congress sent scores of bank officials to visit the headquarters of Renault in Nancy (8 October 1930). But, in 1932, this bank also folded.

In contrast, mechanisation flourished in a more durable fashion at Sogénal; its status as a subsidiary meant that it was subject to a more stringent evaluation of production costs and operational profitability. Moreover, there arose keen competition between the local banks and those from Paris which set up operations in Strasbourg after 1918. At the same time, the Alsatian economy suffered as a result of its separation from the German market after 1925. Moreover, as the parent bank had subsidiaries in Germany, which were conveniently close by, it could gain from their experiences. Be that as it may, its dynamic and progressive managing director, Alfred Pose, and his able assistant Debrix, decided to launch a drive to streamline the process at Sogénal’s headquarters in Strasbourg and to reorganise the flow and the processing of data throughout its network of some dozens branch offices, since Sogénal itself was, like its parent company, a general deposit bank. November 1924 saw Sogénal place an order for equipment capable of delivering ‘mechanical accounting’.¹¹ Over the next 15 years, especially for the processing of cheques and shares, mechanisation gradually caught on, first at headquarters and then at the company’s more important branch offices.

The increasing importance of streamlining and mechanisation

These centres of innovation in Alsace–Lorraine became the ‘schools’ for the large banking firms, which learnt important lessons from these ‘case studies’. Thus, when Alfred Pose left Sogénal to become the managing director of BNCI (Banque nationale pour le commerce & l’industrie) at Paris in 1932, he could make use of the experience he had gained in Strasbourg, thereby greatly speeding up the process of modernisation there. As a whole, these Parisian firms adapted themselves quickly to this new system of mechanisation though, due to high investment costs, the process had to be done in stages. Thus CNEP very quickly subscribed to this drive for modernisation (Bonin, 1992) but despite being the third largest bank in the country, after Société générale and Crédit lyonnais, it struggled to match the pace set by the industry’s leaders, which were engaged in a mighty economic battle and expanding vigorously. Issues of cost-effectiveness, however, prevented CNEP from recruiting freely and even pushed it towards the mechanisation of some jobs. It can also be suggested that its smaller size allowed CNEP greater flexibility in its organisation as the number

of employees who needed to be trained and transferred was also smaller. In any case, CNEP embarked on a modernisation drive in the years 1924–25, and then embarked on a major investment spree with the rest of the Parisian banks in 1926–27. During 1926, to ‘further reduce the workforce’, it doubled its purchases and, spread over nine instalments, bought 90 machines for a total of 2,614 million francs. Then, after reigning in expenses in 1929–30, in order to further reduce costs by completely mechanising all account-keeping it resumed its free hand when the slump began in 1931. CNEP commenced with Paris and its suburbs (using Powers machines) and then, in 1934, went on to mechanise the regional branch offices.

Meanwhile, CNEP’s two major rivals were busy making enquiries regarding the feasibility and cost-effectiveness of investing in accounting machines (also addressing machines, etc.). From the beginning of the 1920s, Société générale set its managerial staff, who were already busy working on a program to streamline working methods, to study ways of cutting costs, especially in the branch offices. This led to a reduction in the number of accounting documents which were till then used only for keeping track of the ‘position’ of client accounts. From 1921, Ellis calculating machines were installed in the branch offices under the aegis of the chief of financial accounting. Later, they were equipped with multiple mobile cards which allowed the transfer of data to headquarters. This first step in the mechanisation process saw the installation of 207 Underwood bookkeeping machines (‘recognised as the best for generating accounting reports and drawing-up monthly balance sheets’)¹² in the provincial branch offices between 1922 and 1930. By September 1930 some 1,672 calculating machines had been introduced throughout Société générale at a total cost of 39.3 million francs, of which 546 (Ellis and Burroughs machines) were installed at its headquarters. A review of the company’s assets in 1932–34 revealed the extent to which mechanisation had permeated the main services of Société générale:¹³ practically all of its departments were equipped with machines to suit their functions. Thus, over the span of a decade, the management of the bank underwent a complete transformation. The evidence for this lies in the rapidly increasing number of ‘instructions’ for the reorganisation of the working of the services, both in Paris and the provinces, guides for the processes and assessment notes regarding the implementation of these changes. The fourth quarter of 1927, for example, saw the compilation of a massive assessment report by the management prior to an intensification of the streamlining efforts under the aegis of the chief executive officer, Henri Ardant, who wanted to further reduce operating costs. As for Crédit lyonnais, Omnes (2003) has shown how the process of mechanisation had gathered momentum since 1924–6; a special department of Mécánographie was set up in November 1926 so as to gauge the equipment proposed by industrialists and to organise the offices to be modernised. This move led, by 1932, to the establishment of a stock of 892 accounting machines, 714 adding machines (Burroughs, Underwood Bookkeeping) and 508 calculating machines.

This move towards mechanisation spread widely and also affected a number of medium-sized banks. At CCF, the process covered the years 1922–30, an added impetus being provided from 1926 onwards when a complete modernisation program for the entire organisation was launched in Paris as well as the provinces: total expenditure on the program came to some 14.1 million francs. An idea of the depth and

reach of this ‘technological revolution’ may be gauged from the fact that every merger or liquidation during 1931–4 brought to light assets which invariably included scores of ‘accounting and calculating machines’. When *Banque privée* collapsed in May 1931, its movable assets were valued at around 8 million francs, of which the 130 accounting machines totalled between 1.85 and 2.3 million, equivalent to 6 to 8 per cent of the value of all immovable property (headquarters plus the entire network of branch offices)!¹⁴

Such investments in machines resulted in a two-fold gain: on the one hand they helped reduce the number of employees and cut operating costs while, on the other hand, they improved the quality, reliability and speed of services:

The introduction of typing and calculating machines at a cost of 900 000 francs, of which a third has already been amortised (depreciation in three years), has allowed a reduction of 70 to 80 jobs which itself translates to an annual saving of 500 000 francs. Moreover, all the entries of a day can be reflected in clients’ accounts by the very next evening and it is now possible to provide daily statements.

(Record of proceedings of board of directors of Banque générale du Nord, 15 novembre 1926, Crédit du Nord–Société générale archives)

CNEP observed: ‘The advantages of this transformation in banks can be seen as much from the point of view of decreasing operating costs as in the increase in the speed and efficiency of work’.¹⁵

Some sluggishness in the mechanisation process?

On the other hand, the delay in adopting mechanisation by some firms reveals a technological gap which began to surface, together with the potential gains in cost-effectiveness. The small Société normande de banque & de dépôts, based in Caen, thought of getting onto the bandwagon only in June 1931, with the purchase of a Burroughs–Moon machine ‘to see to what extent mechanisation would help in reducing the manpower’.¹⁶ At the same time, it must be noted that mechanisation did not always carry the day when investment in machines was pitted against the quality and cost of manual labour. For example, Crédit lyonnais rejected mechanisation of calculations within its portfolio service as the computation of interests and commissions was deemed more reliable when performed by the 45 employees in the team.¹⁷

Banque de France itself did not miss out on this mechanisation wave, faced as it was by major operating costs and the collection of commercial paper from all over the country. In the mid-1920s, a program for investing a total of 20 million francs (for typing, copying and calculating machines) was set up, of which 4 million francs were earmarked in 1926 for calculating machines imported from the United States. At the same time, these investments were subject to variations and adjustments: in 1927, due to budget constraints, they were suspended altogether and only a few machines were replaced. But within a short space of time, managerial necessities required further purchases in January–February 1929 for both its main office and its foreign bank services, comprising a Moon Hopkins with four adding machines and a Burroughs Multiplex.¹⁸ Though Banque de France’s subsidiary in Bordeaux

may seem to have been well equipped with machines from 1926,¹⁹ the bank had to admit that its subsidiary at Lyon, which was of far greater importance, 'had only 11 Burroughs and 1 Moon' in February 1929.²⁰ This meant that documents relating to the handling and keeping of securities, important aspects of its work, had to be processed manually, a situation which remained unchanged until November 1931. The expenses associated with mechanisation fluctuated between 1.1 and 2 million francs per annum during the first half of the 1930s. Though not sufficient, that was all that was possible under the prevailing economic conditions.

In practically every case, mechanisation was accompanied by investments in buildings and equipment. Work areas for processing information had to be established and huge spaces were allocated for this purpose at the main bank headquarters. In addition to the machines, employees were also provided with related equipment such as trays for arranging the daily index cards, large cupboards in which to store these cards (for example, the Vendex card index system which was installed at CCF in 1926–7), etc. Finally, internal electrical networks had to be installed which also meant supplying the required electricity.

The coming of age of the streamlining and mechanisation of banks (from the second half of the 1930s to the first half of the 1960s)

While the streamlining of tasks and installation of accounting machines was going on, the march of progress took another big step forward with the introduction of electric accounting machines. This development is now examined.

The inroads made by electric accounting machines in the second half of the 1930s

From as early as the 1930s, electric accounting machines began entering into the market at a modest rate of some 50 machines per year for the whole bank sector, but it was only in the second half of that decade that they became more or less reliable and came into their own. At first they were used mainly for the accounting work associated with cash and securities. Their advantage lay in the fact that data only needed to be entered once, there being no need to have to repeat the process for different accounts, as had been the case previously. Prior to the introduction of accounting machines, information about daily transactions was summarised in the accounts worksheet. The accounts worksheet, which was established by the accounting department, then provided information which was passed on to the client's account to record any 'account activity' and then had to be transmitted to the 'positions' department so that it could be checked and adjusted with the elements of the accounts department so as to avoid errors of 'position' and to correct them. Avoidance of such errors was important because they were always very difficult to correct *a posteriori* once the customer had received a statement of the balance of his account and asked for a recalculation of the figures. Moreover, the need for such recalculations gave the client a very negative image of the bank. As for securities, records of proprietary accounts had to be calculated on a quarterly basis in order to calculate the closing interest.

During the inter-war period, the sheer quantity of paper and figures that had to be managed assumed enormous proportions and boosted the demand for electric accounting machines. Though the entry of punched cards, on gang-punching and checking machines, was done twice, the second time to verify whether the two entries matched by placing one card against the other, machines (sorters and collators) also classified the accounts automatically according to any given criteria. Moreover, these tabulating and calculating machines also recorded, calculated and furnished print-outs. Even before the advent of electronics (valves and transistors), these machines were no longer driven mechanically, but by electromagnetism which, by eliminating the inertia of mechanical parts, markedly increased their operating speeds. Tabulating machines were now joined by electric machines specialising in doing only a part of the operations: calculators, copiers, etc. From 1934, a number of such electric accounting machines were installed by the *Crédit lyonnais* and, in 1939, they helped in the accounting work connected with some 1.5 million clients' securities records from across the company's French network.

The centralisation of operations within accounting offices and then within the first 'service factories'

The march of mechanisation also had repercussions for the structure of the banks themselves by generating a reorganisation and reallocation of the accounting equipment. 'Non-accounting offices' were introduced, for which all of the bookkeeping was done at headquarters, which was suitably equipped with the required machines. In 1931, for example, *Société générale* centralised all the accounting for its Parisian branches in a single building. Medium-sized banks came together and also centralised their accounting work as did, for example, *Crédit nantais*, which had its bookkeeping work done centrally on Multiplex and Burroughs Moon Multiplier machines (1934), in a manner achieved by similar banks elsewhere.

The diffusion of electric accounting machines opened a debate as to whether to maintain equipment in larger offices within a network, or whether it would be better to centralise their operations in a single location. BNCI, a large Parisian bank which, since its inception in 1932, had been pursuing an aggressive policy in order to challenge the three premier banks of the country, embarked upon a complete restructuring of its regional organisation. Between the mid-1930s and the mid-1950s, BNCI established six large installations or 'service factories', huge work areas equipped with electric accounting machines, where all the work from its entire network was processed centrally. This ambitious investment policy enabled BNCI to strip out of its branch offices the equipment which had originally been installed there, either under the auspices of BNCI or its predecessor, the *Banque nationale de crédit*, prior to its disappearance in 1931 (Bonin, 2002c), and also justified itself since it enabled the bank to rapidly expand its network and business, in part through the buying out of other regional banks.²¹

Meanwhile, *Crédit lyonnais* also chose to centralise, at the regional level, the processing of all work regarding securities and coupons which hitherto had been done at the branch offices. The centralised system in these banks took care of the essentials of

all client accounts and provided their 'positions' just as in the German and Belgian banks where summaries were sent back every morning after having been processed the previous afternoon.

In contrast, Société générale preferred the 'spot position' method practised in most Anglo-Saxon banks, in which the subsidiaries kept their own accounts with the help of accounting machines. This had the advantage of avoiding the duplication of the records regarding accounts and positions so widespread in French banks.

(Lorain, 1952: 13)

But, in many banks, only the larger offices were equipped with the required machinery. For example, in 1935, Société nancéienne reorganised itself and differentiated 'subsidiaries' and 'accounting centres' of the 'regional business offices' from the non-account-keeping 'branch offices' connected to these subsidiaries.

The final and resounding success of electric accounting machines (the 1950s and 1960s)

The reconstruction and expansion of the 1950s and 1960s, through generating a growth in the middle class which formed the majority of banks' clientele, reinvigorated banking in France (Bonin, 1997). It was in this framework, and prior to the establishment of 'banks of the masses', that the saturation of existing data processing methods led to the innovation of new technology and the spread of electric accounting machines (Hammer, 1958: Ch. 3). Only the rapidly expanding volume of operations could justify the massive investments in these machines. Even so, they had to pay for themselves through carrying out work which could be done as in an assembly-line. On the other hand, the entire system for the distribution and processing of data had to be restructured, the techniques of every department remodelled and the supporting infrastructure completely revised around the main centres in order to multiply the mini service factories which contained these electric accounting machines. These machines spread throughout all large and mid-sized banks and were used extensively: 'In 1955, the CIAL [Crédit industriel d'Alsace-Lorraine] introduced punched card machines to keep track of client and cash accounts',²² which remained functional until 1964. This was the pinnacle of this mini-'technological system' and allowed the banks to increase their operations considerably.

The limits attained by the system of electric accounting machines

The system of electric accounting machines had brought the 'technical model' of the mechanisation of banking to its 'optimum'. The French banking system could thus successfully meet the constant challenges arising from the rapidly increasing scale of operations and, when operations failed to increase, they could help in reducing operating costs. This said, the whole programme of mechanisation comprising the installation of equipment and electric accounting machines had its limits. First of all, a large part of the work could not be done by these machines, simply because there were never enough of them; this explains the continued dependence on

‘old types’ of accounting machines, which hampered productivity gains. Second, these new electric machines needed to be fed with punched cards for every operation; unlike the computers which succeeded them, they did not have any ‘memory’ – that is, a storing device for speedy access to data such as a magnetic drum—and had to be always fed with data. They proved to be efficient only when working on long, sequential tasks. Frequent changes in the work reduced their output considerably because the plugboard dispatching instructions had to be changed each time, the printers re-adjusted, the running of the new program checked through punched cards, etc., all at the cost of valuable human resources.

Yet another problem was felt much more keenly: the use of electric accounting machines necessitated a Herculean task in remodelling the service centres of these banks. The accounts services were entirely reorganised which, by the way, contributed to the growth of a relatively new branch of activity, consultations on bank reorganisation. Within a short span of some 15 years, the entire internal organisation comprising the circulation of vouchers and the implementation of ‘command’ and ‘control’ hierarchical networks, had to be looked into and dealt with. ‘The running of the machines, the preparation of the plugboards, the planning of the work modalities (the punched card and printing schedules) could be done only by people who had gone through, at least for the more delicate operations, a time consuming training process’ (Hammer, 1958: 51).

On the other hand, those who were busy streamlining the process came up against an unexpected obstacle, the wearing out of equipment. The heavy use of these machines meant that they wore out within a few years. A depreciation account had thus to be introduced which would anticipate replacements and schedule expenses in keeping with the change in the technology. For example, in 1932–4, studies within Société générale indicated the operating costs necessitated by the ageing of these machines: ‘The machines which had been run very heavily these past few years were the most affected’.²³ Though the visits by maintenance and service engineers from the suppliers multiplied, sometimes the machines were found to be beyond repair:

This service is equipped with 39 Ellis machines, some of which, having been used extensively from the beginning, have worn out completely, making repairs very difficult. We are trying our best, but the mechanical balance can no more be maintained due to the fact that the major parts replaced are not of the same calibre as the originals [...]. Of the 39 Ellis, 23 had been acquired in 1922 and 1923.

(‘Compte rendu sur l’état du matériel Ellis du groupe Kleber’, December 1934, Société générale archives)

Lastly, though the system of streamlining and mechanisation of the daily work in banks attained its maturity during the years between 1940 and 1960, typewriting machines predominated in many smaller enterprises. They were used extensively by branch networks and in co-operative banks which were then on the rise, such as Crédit agricole mutuel. But, in the regional and central branches and in data-input centres, carbon copying was used massively. It required that data be entered only once: a copy was kept at the base while other copies were circulated. The Kalamazoo system²⁴ thus became a benchmark in accounting services, whether banking or not.

It is understood that there still remained the problem of discontinuity in the data entry, which led to some inconsistency in the final accounts.

Conclusion

For the decades prior to the last third of the twentieth century, despite the work done by specialists in industrial economics within institutes of management or economics, the history of banks as 'business enterprises' still contains many gaps. Nevertheless, a 'prehistory' of their management would serve to see how banks evolved from a rather informal type of business enterprise, where the administrative and accounting methods dated back to those of the fifteenth to eighteenth centuries, into an 'organised' company. In this article we have argued that streamlining became a keynote of the evolution from informal to a new type of formal service economy, as banks suddenly came to terms with not knowing the extent of the risks that they ran. No doubt, the need to control these risks led to the rapid adaptation of 'industrial' methods to put in place a true 'service organisation'. One part of the vast set of reforms which took place in the years between 1920 and 1960, however, concerned the introduction of accounting machines.

Standardisation, normalisation, the elimination of redundant paperwork and the duplication of services, and the fixing of the control and mechanisation processes (whether of the entries with typing machines or accounts) all played an equally important role in this structural transformation. Social forces too had their say: the banks were faced by a massive increase in workload and manpower while inflation and wage demands swelled the operating costs. Though mechanisation and streamlining helped contain these figures, just as in industry and administration, there arose hierarchical strata in which administrative and technical officers assumed ever-increasing importance. Although the people managing these new 'tertiary organisations' remained a minority within their organisations, they began to exert an ever-increasing influence within the large banks: in the name of modernisation in the 1920s, then as a 'parachute' against the steep fall in profits during the crisis of the 1930s and finally, as an aid during the massive expansions of the 1950s.

We have clearly delineated the route taken by the process of mechanisation and the set of influences which helped propagate the technological innovations at the European and national scales. We have also identified the elements in the dissemination of the technological know-how within the banking community and the organs for its promotion such as the review *Banque*. We have also traced the chronology of the process of mechanisation with its rapid development in several firms during the 1920s, the increase in the installations of accounting machines in the 1930s and also the entry of the electric accounting machines which thrived in the 1950s and into the 1960s. Finally, we have dwelt upon the consequences of this mechanisation on the entire work organisation of banks and the establishment of small, big and even large organisations comprising hundreds of machines in outbuildings or, as in the case of CCF, underground. It is clear that this stage, however interesting for the 'streamliners' of the era, seems in hindsight to have been only a transitory phase in the history of the accounting machine, one which came just before the

electronic revolution and the appearance of computers, such as the IBM and the Bull (Bonin, 1988), which appeared in the mid-1960s.

Notes

1. Record of proceedings of board of directors of CCF, 25 May 1923, CCF archives.
2. Record of proceedings of board of directors of Banque générale du Nord, 16 May 1927, Crédit du Nord-Société générale archives.
3. Record of proceedings of board of directors of Banque générale du Nord, 15 March 1926, Crédit du Nord-Société générale archives.
4. Remington Rand was formed as the result of two mergers, one in 1925 between Rand Ledger, established in 1876, and American Kandex, founded in 1915, and a second in 1927, of the former merged entity with Remington Typewriter. Remington Rand also took over Dalton Adding Machine Calculators and Powers Accounting Machine (Cortada, 1998).
5. Computing Tabulating Recording, created in 1911 by the merger of several firms, became IBM in 1924, after having devised a tabulating and printing machine which competed against the Powers models (cf. Belden and Belden, 1962). In Germany, from 1922, IBM had used its sister company, Deutsche Hollerith Maschinen Gesellschaft mit begrenzter Haftung (Dehomag).
6. The company's automation service was launched in 1931.
7. The Powers machines distributed by Samas (*Société anonyme de machines à statistiques*) were made in Cincinnati in the United States, while the Samas machines were imported from Croydon, England.
8. The information in this section has been obtained from the archives of BAL and files relating to the company held in the archives of Crédit industriel & commercial (CIC). In addition, we are grateful to Lars Heide, of Denmark, for supplying us with information contained in a report entitled, 'Modern bank accounting on Powers machines, as adopted by the Banque d'Alsace-Lorraine, France' (Hagley Museum & Archive, Wilmington, Delaware, USA, Accession 1825, Legal correspondence, folder Banque d'Alsace-Lorraine, 1930).
9. At the same time that the entry was typed on the accounting sheet, the machine simultaneously generated the result of each operation which was then sent to the client. The machine calculated the balance and added up all the transactions relating to the account.
10. The article deals with the modernisation of BAL's branches in Paris and elsewhere, excepting those in Alsace-Lorraine.
11. Record of proceedings of board of directors of Société générale, 8 November 1924, Crédit du Nord-Société générale archives.
12. File, 'Situation of 'Bookkeeping' machines in the regional outlets, Mechanisation of banking work', Crédit du Nord-Société générale archives.
13. All data taken from records on mechanisation in Crédit du Nord-Société générale archives.
14. Valuation by CIC of the equipment in the Banque privée, 'Note from the legal department of the Société lyonnaise de dépôts, 23 May 1931', Société lyonnaise de dépôts archives.
15. Record of proceedings of board of directors of CNEP, 22 April 1931.
16. Société normande de banque & de dépôts archives.
17. 'Note on the mechanisation of the encryption service', Dossier Études statistiques, 15 October 1929, Crédit lyonnais archives.
18. Records from the general council of Banque de France, varia, Banque de France archives.
19. Banque de France's subsidiary in Bordeaux was rich in calculating machines, 'particularly in the discount department which had five Burroughs and an Underwood Bookkeeping,

a machine to verify the premiums'. They were complemented by another Burroughs 'for calculating the positions of the arrears in assignments' and a Burroughs Moon for generating the details for those employees (*garçons de recettes*) charged with recovering bills of exchange. But, 'the positions of the payment schedules and statements would be helped greatly by the addition of another Burroughs adding machine' (Inspection report at Banque de France's subsidiary at Bordeaux, May 1926, Banque de France archives).

20. Inspection report at Banque de France's subsidiary at Lyon, 1926, Banque de France archives.

21. Ultimately, BNCI merged with CNEP to form BNP (Banque nationale de Paris) in 1966 (Torres, 2000).

22. 'Note on the working method in banks', Crédit industriel d'Alsace-Lorraine, CIC archives.

23. 'Compte rendu sur l'état du matériel Ellis du groupe Kleber' (Report on the state of Ellis equipment in the Kleber Group), Maintenance of securities, December 1934, Crédit du Nord-Société générale archives.

24. Kalamazoo was formed in 1904 in the USA to promote a system of data acquisition by means of mobile sheets. It was taken over by Remington Typewriter in the 1920s and spread into France via an autonomous sister concern.

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