Lars Heide

# National Capital in the Emergence of a Challenger to IBM in France

During the inter-war years, the punched card trade in the various European states grew to become an indicator of change in society. A punched card installation consisted of several single machines that were applied to process punched cards, which were manually carried between the machines. By the end of the First World War it was an established numeric tool to process varius kinds of business statistics. The boom of the 1920s was reflected in the significant growth of the punched card trade. Punched cards became a key tool in the widespread rationalisations, for example in France and Germany. Even in the depressive 1930s, the punched card trade flourished - except for the first bad years. Now, the punched card technology had been developed to become a high-tech bookkeeping tool, and it was further developed to facilitate the handling of registers with alphanumeric information, like in the French national register, established from 1940.

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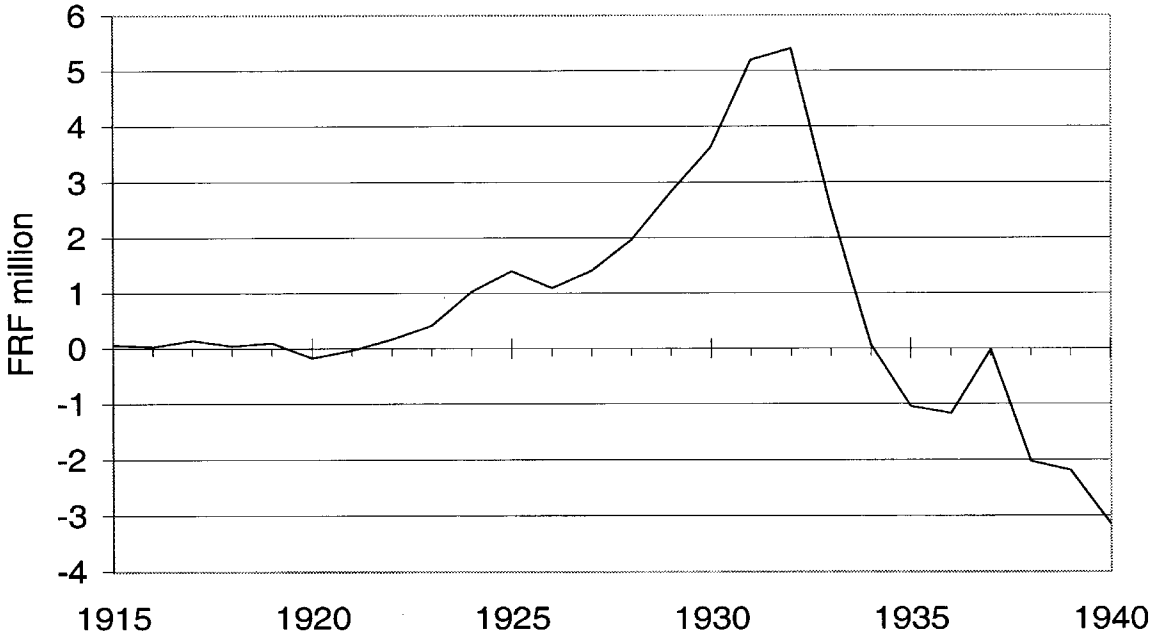


*Figure 1: Total net profits of IBM's subsidiaries in France, 1915-1940, prices of the year. (Jaques Vernay, Chroniques de la Compagnie IBM France, Paris: IBM France, 1988, p.266.)*

In the United States, IBM and its predecessor companies had been prime mover in the punched card trade from the 1890s. From 1904, they extended their business to Europe by setting up agencies in the various European countries, and, subsequently, the agencies were changed to become subsidiaries of IBM. By the end of the 1920s, IBM controlled the punched card trade in all of the countries on the European continent, while three independent competitors existed. The first was an American company and the second a British, both originally based upon the inventions by James Powers in the United States during the 1910s. They apportioned the various European national markets, but they shared the French market. Only in Britain did they accomplish to attain a market share of more than about 15 percent. The third competitor originated in Norway in 1918, when Fredrik Rosing Bull started to build punched card machines. Bull died in 1924, but his machine building was continued by others in Norway, and in 1931 it was relocated to Paris.[1]

During the 1930s, France became the only exception to the IBM control of national markets in continental Europe. The basis for this exception was the establishment in 1931 of the competing producer of Bull punched card machines in Paris, based mainly upon Belgian and Swiss capital. During the next two years, this company=s Frenchness was increased through

[1]. Lars Heide, "From Invention to Production: The Development of Punched-card Machines by F.R. Bull and K.A. Knutsen, 1918-1930", *IEEE Annals of the History of Computing*, vol.13 (1991), p.261-272.

three expansions in the share capital that provided a majority of French share capital, and the company was named *Compagnie des machines Bull* (Bull).[2] On the basis of this development, the French challenger=s high market share in France may be explained through the importance of national capital. This suggestion can be substantiated by national preferences in public acquisitions in France during the 1930s that became evident during the Pierre Laval government from 1935 to 1936.[3] By then, the national government=s acquisitions of punched card equipment were important, as they were estimated by a supplier to amount to 60 percent of the total market.[4] The French army=s acquisition of punched card equipment may exemplify the shift from IBM to Bull as punched card supplier. From 1932, the French army got several punched card installations to control the expenses at their artillery workshops. While the early French army installations used IBM equipment, from 1934 their new installations exclusively became based upon Bull equipment.[5] Further, the net profits of IBM=s subsidiary in France show a significant drop in profits in the mid 1930s as Bull took off (Figure 1). But the turnover figures of IBM=s subsidiaries in France are not known from this period, as their publication was not required. If only for accounting reasons, this opens for several alternative explanations, which will not be explored here. However, a question mark remains on the role of national capital, as a basis for national preferences. A key to understand the mechanisms of national preferences is to analyse the actions of the people who promoted or utilised them, and their social networks. Was national capital their end or their means?

To discuss the mechanisms and implications of national preferences in the French punched card trade during the chauvinistic 1930s, I will first present the French punched card market and its two suppliers in the 1920, and I will analyse the emergence and growth of the *Compagnie des machines Bull* (Bull) from a capital perspective. Then I will address the influence of the networks of *polytechniciens* and of carrier officers in the French army. Finally, I will discuss the implications of my analysis .

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[2]. Lars Heide, AMonitoring people in France: From the options of French army operational statistics to the perils of record management between 1932 and 1944", *Technology and Culture*, forthcoming.

[3]. ACirculaire@ No. 34 from P. Laval to the Minister of War, 24 December 1935, folder 6, box 8 N77, series N, in *Archives du Service historique de l'Armée de terre* (ASHAT), in Château de Vincennes, Paris.

[4]. Circular "District 'A' - concurrence Bull", 18 November 1937, in Bull Archives, Paris, box: 2.12 (affaire Bull), fld: "Dossier reunis b. 26-12-51"

[5]. Heide, forthcoming.

## The punched card suppliers in France in the 1920s

The first punched card application in France had been the processing of a part of the national census in 1896. Early punched card machines from the company, which in 1924 became IBM, were applied. The success was curtailed and the *Statistiques générale de la France* (French National Statistics) preferred to build their own machines (*classi-compteur*) based upon a different concept. These machines were used to process the French censuses for the following thirty years.[6]

For that reason, punched cards did not diffuse in France for twenty years, and there was not any punched card application in France, when the predecessor company to IBM got a subsidiary on France, in 1914, which held varying names trough the years. The first commercial punched card application in France was introduced in 1921 at the French subsidiary of SKF (*Svenska Kullager Fabrik*, the Swedish ball bearing producer), and several big French companies followed suit during the 1920s. In 1925, IBM had 20 customers in France, growing to 30 two years later.[7] The other punched card supplier in France during the 1920s was SAMAS (*Société des machines à statistique*, Statistics Machine Company), a subsidiary of the British producer of Powers machines established in 1922.[8]

The diffusion of punched cards in France occurred within the breakthrough of industrial rationalisation. Since 1906, a few companies, like the tire producer, Michelin, and the car producer, Renault, had introduced studies of their working processes as a basis to improve productivity, along the lines suggested by the American engineer Frederick Windslow Taylor. But it was only after 1920 that many companies joined them. Michelin and Renault soon got punched cards to process their operational statistics. The 1920s also witnessed office rationalisation, including new accounting methods. Trained engineers were key agents in this process.[9]

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[6]. Robert Ligonnière, *Préhistoire et histoire des ordinateurs*, Paris: Robert Laffont, 1987, p.143-146.

[7]. John Connolly, *A History of Computing in Europe* (New York, 1968), E2-E7, E57-E58; Jacques Vernay, *Chroniques de la Compagnie IBM France*, Paris: IBM France, 1988, p.17-18, 20.

[8]. Martin Campbell-Kelly, *ICL. A Business and Technical History,* Oxford, UK: Oxford University Press, 1889, p.68.

[9]. Aimée Motet, *Les Logiques de l'entreprise: La rationalisation dans l'industrie française de l'etre-deux-guerres* (Paris, 1997), 15-110; Delfine Gardey, *Un Monde en mutation: Les employés de bureau en France 1890-1930: Féminisation, mécanisation, rationalisation* (Université Paris 7: Disertation, 1995), 824-836;

## *Compagnie des machines Bull* and the importance of its capital basis

The original Bull punched card machines were designed in Norway by the engineer Fredrik Rosing Bull and they were build by a local precision maker. Bull died in 1924, but his machine building was continued by others in Norway. In 1928 and 1929, Swiss-Belgian interests acquired the Norwegian patents and expertise, and in 1931 they relocated their machine building to Paris.[10]

A new company, Egli-Bull, was established in Paris to develop and produce the Bull Machines. Egli came from the H. W. Egli adding machine producer in Zürich, the Swiss majority shareholder, and production was established in the existing ATEIC (*Association Technique d'Etudes Industriels et Comptables*) workshop in Paris, which turned from the manufacturing of American office machines to Bull machines. The new company had a share capital of $ 140,000 (FRF 3.6 million), but only $ 50,000 (FRF 1.0 million) was paid, as the remainder was paid as bonus shares for the patent rights, hold by the H. W. Egli company in Switzerland, and the ATEIC workshop, who was the only French shareholder.[11]

The new company got no easy start. It was complicated to transfer a technology from Norway to France, the economic crises raged in Europe and the new company had to construct additional punched card machines to emerge as a full competitor to IBM and Powers. All three problems hit the company during its first year, but they succeeded in building and supplying their first major punched card machine to the Ministry of Finance by the end of 1931. As a result, as early as that, the Bull company had a significant deficit, and they needed about $ 94,000 (FRF 2.4 million) as additional share capital, that is an amount of 2.4 times the originally paid share capital. To aggravate the situation, the Swiss majority shareholder, the H. W. Egli adding machine producer in Zürich, needed to sell some of their

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Ludovic Cailluet,, "Accounting and Accountants as essential elements in the development of central administration during the inter-war period: management ideology and technology at Alais, Froges et Camargue", *Accounting, Business and Financial History* 7 (1997), 295-314.

[10]. Lars Heide, "From Invention to Production: The Development of Punched-card Machines by F.R. Bull and K.A. Knutsen, 1918-1930", *IEEE Annals of the History of Computing*, vol.13 (1991), p.261-272.

[11]. "Société Egli-Bull", June 1932, in Bull Archives, box: 92 HIST-DGE 01/2; Réunion Conseilles d'Administration, 9 March 1931; both in Bull Archives.

shares, probably, due to falling demand caused by the world economic crisis.[12]

The need for additional capital to the small Egli-Bull company and the financing of further punched card machines development could be solved in two ways: through the takeover by a foreign producer, or trough the acquisition of French capital combined with further machine development within the Bull company. Both possibilities emerged successively in 1931.

Back in April 1931, Remington Rand had approached the main shareholder in the nascent Egli-Bull company, the H. W. Egli company in Zürich, to buy the rights to the Bull machines outside France. In 1927, Remington Rand had acquired the only competitor to IBM in the United States, and they now needed to improve the performance of their machines. In the summer of 1931, directors from Remington Rand visited the workshops in Paris.[13] Remington Rand had vast resources and wanted to strengthen their position through the acquisition of the Bull patents. During these negotiations, which lasted until December 1931, Remington Rand became aware, that Egli-Bull was seeking capital, and they offered to invest $ 230,000 (FRF 5.9 million); that is, Remington Rand would take over all the existing shares and Egli-Bull would receive an extra capital of $ 90,000 (FRF 2.3 million). In addition, Egli-Bull could get access to Remington Rand=s technology, though the advantages would be curtailed due to their different basic technology.[14]

As the negotiations between Egli-Bull and Remington Rand were approaching an agreement, one of the directors from Egli-Bull got in contact with two Frenchmen, Georges Vieillard and Elie Doury. Since 1929, they had been working to establish a production of punched card machines in France on a different technological basis. As that attempt had failed, they now offered promptly to raise the needed capital in France for the Bull company. Simultaneously, they wanted to cooperate with Remington Rand who was offered a minority block of shares and a post on the board. Remington Rand was asked to appoint a Frenchman to underscore the Frenchness of the company. The cooperation should include technical and business matters.[15]

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[12]. "Rapport sur la situation financier de la Société Egli-Bull au 31 décembre 1931", in Bull Archives, box: 92HIST-DGE 01/2.

[13]. Pierre-Eric Mounier-Kuhn, "Bull: A World-Wide Company Born in Europe", *Annals of the History of Computing*, vol.11 (1989), p.282

[14]. Telegrams from U.S. Powers to Bull or Egli, Zürich, 11-12 December 1931; letter from AITEC (Vieillard, Genon, Vindevoghel), Paris, to Remington Rand, New York, 15 December 1931, both in Bull Archives, box: 2.3 (Remington Rand, 1931-1960), fld.: RR-1931.

[15]. Letter from AITEC (Vieillard, Genon, Vindevoghel), Paris, to Remington Rand, New York, 15 December

While Remington Rand's offer was backed by a big company, Vieillard and Doury rapidly needed to raise the required capital from a group of punched card users, which they tried to organise. The most urgent part was to raise $ 24,000 (FRF 600,000) to acquire shares from the Swiss company H. W. Egli company, in order to relieve that company's financial situation. In early December 1931, Georges Vieillard established a consortium of punched card users in France (*Le syndicat des utilisant de matériel mécanographie*), who were willing to provide the amount required to buy the H. W. Egli shares in Switzerland and to finance the much needed expansion of Egli-Bull's capital. The consortium consisted of various industrial producers, railway operators and insurance companies. Prominent among them was the Société des Papeteries Aussedat, a manufacturer of paper and cardboard, which later became a large punched-card producer.

The consortium of users offered Egli-Bull a second choice, and its board choose the French option. In April 1932, the capital increase was achieved, which caused the majority of the company's share capital to become French. The H. W. Egli company in Zürich received the funds they needed, which reduced them from a majority to a minority shareholder. Remington Rand was not willing to become a minority shareholder and no agreement on technological cooperation emerged. Therefore, the Paris company had to accomplish by itself the much needed machine development, but the Frenchness of the Egli-Bull company should prove advantageous for collaboration with the French state. In 1933, the company was renamed Compagnie des Machines Bull (CMB).[16]

The increases of share capital in 1932 and 1933 had been reflections of the young company's problems to produce reliable machines and to compete with IBM without having a complete line of reliable punched card machines. Only in 1935 did Bull accomplish to produce a basic line of punched card machines, but the company=s situation was aggravated as a large part of the trade was leasing of machines, which required more capital than selling. The outcome was deficits through 1935 (Figure 2), which made urgent to raise additional capital. Simultaneous, the

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1931, in Bull Archives, box: 2.3 (Remington Rand, 1931-1960), fld.: RR-1931.

[16]. "Rapport sur la situation financier de la Société Egli-Bull au 31 décembre 1931", in Bull Archives, box: 92 HIST-DGE 01/2.

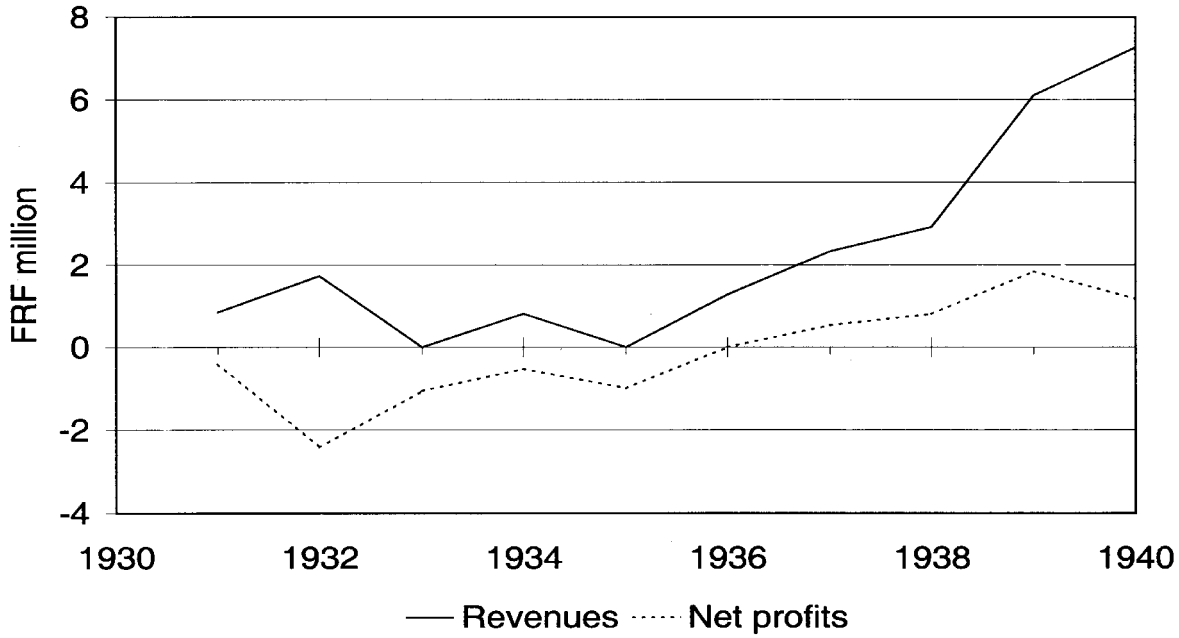


*Figure 2: Revenues and net profits of the Compagnie des machines Bull, 1931-1940, prices of the year. ("Rapport sur la situation financière de la Société Egli-Bull au 31 décembre 1931", Assemblée Générale, Compte de résultats, 1933- , in Bull Archives, Box 92 HIST-DGE 01/2)*

company was encouraged by a growing number of costumers and increasing orders.[17]

Meanwhile, Bull had for several years been working to alleviate their problems. From 1932 to 1934, the company tried, in vain, to find a partner in Great Britain, Italy, Czechoslovakia, Soviet Union and the United States. In all these negotiations, it was a condition that two-thirds of the

share capital should remain among French and Belgium share holders.[18] In 1935, the Bull company=s financial problems grew serious and the company first tried to obtain aid from the French state to support research and development, but the state hesitated. Then the Bull board turned to the United States to find a partner, and they both approached Remington Rand and IBM. The chairman of IBM, Thomas J. Watson, came to Paris where he met with Jacques Cailles and Georges Vieillard of the Bull board of directors and offered them an agreement of cooperation on the condition, that could IBM could obtain a majority of the shares in the Bull company, that is, he wanted take over the Bull company. The discussions were tough. Many

[17]. "Liste des equipments vendue, juin 1935", "Liste des equipments loués, juin 1935", Bull Archives, Box: 92 HIST.DGE 01/2; note from Vieillard to Bassot, 14 May 1934; note from Bosman to Vieillard, 28 January 1935; note from Guerner to Vieillard, 26 July 1935; all notes in Bull Archives, box: 3.1, fld.: Products 1931-1946.

[18]. P. Cailles, Aussedat, to M. Bassot, CMB, 12 September 1934, in Bull Archives, blue ring-folder: "Compagnie de Machines Bull. Fisches ... annuelles 1931-1934".

years later, Georges Vieillard remembered Watson to have said "Mr. Frenchmen, you got up too late to conduct this trade." The French answer should have been: "Mr. Watson, the sun shines on all of us, we will not do anything against IBM, but France have the right to have a punched card industry. That is exactly the objective we pursue and which fill us with enthusiasm. We will stay independent and do everything to remain."[19] IBM did not archive to buy the Bull company, which would proceed to navigate lonely.

As a consequence, Bull had to rely on French capital, which was supplied by the Cailles family, who owned the Aussedat paper mills. They had contributed to the raising of additional capital for the Bull company in 1932 and 1933, and Jacques Cailles was their representative on the board of Bull. Now, they became the majority shareholder through additional investment. Two reasons could exist for this investment by the Cailles family: to safeguard the Bull company in French hands, or to consolidate the Aussedat company through a forward integration. The reason of safeguarding in French hands appears from the already related history of Watson=s negotiation in Paris. The importance of national capital explains why Frenchmen invested in the Bull, but it does not explain how the Cailles family were selected to accomplish this task, which may be explained through a strategy by the Aussedat paper works of forward integration. By 1935, they were providing Bull with punched cards, a business relation dating back to the early days of the Bull company in France. Bull approached Aussedat to acquire punched cards, but Aussedat had difficulties manufacturing as good a quality of cardboard as the paper mills in the United States. To improve the quality of their punched cards, Aussedat obtained a licence from the Racquette River Paper Company in the United States, who was a manufacturer with a reputation for punched card production. Since then, Bull had provided ever-increasing prospects for the Aussedat paper mills. Now the threat of a takeover by IBM worried Aussedat, as IBM required their costumers to buy punched cards from them.[20]

After Bull had received this, the third, increase of share capital, the company went well during the remaining part of the 1930s. From 1935, the company achieved to produce well functioning machines, and by 1942, it accomplished to be fully competitive with IBM through

[19]. Conseils d'Administration, 12 June 1935, 18 October 1935; exchange of telegrams between E. Genon in New York and the Bull board, 7-18 May 1935, in Bull Archives, box: 2.3 (Remington Rand, 1931-1960, fld.: RR-1931; D. Pagel, interview with G. Vieillars, in Bull Archives, box: 2.1.

[20]. Mournier-Kuhl 1989, p.284.

the construction of the last of the required several punched card machines. From 1936, the French Bull company attained a surplus. While the increases of share capital in 1932, 1933 and 1935 had been caused by operating deficits, from 1936 to 1939, the surpluses were the basis for the company=s expansion.

Really, an idyl that appears to confirm the success of a company in France during the 1930s - once national capital was attained. However, this story opens for two more general questions: was >national capital= and an end or a means? and why was >national capital= important? The first issue of end or means appeared in the unsettled question of the motives for the Cailles family to invest in the Bull company: was it a patriotic deed to safeguard a French production of punched card machines? - or was it just a bid to integrate forward? The second issue of why >national capital= is an important tool for national preferences can not merely be settled through statistics of the distribution of the various nationalities of shareholders in French companies. Answering this question requires the study of the mechanism that made French capital into national preferences. As this was accomplished by the Bull company people, their customers and related people in French business and Civil Service, the study of their key social networks provide an approach to discuss these national capital questions.

## Networks provide the dynamic

For the study of the dynamics of the Bull company, the two key important professional networks were the interlinked networks of French army carrier officers and of *polytechniciens*, that is the engineers trained at the distinguished *École polytechnique* in Paris.

The *polytechniciens* emerged first in the history of the Bull company in France. They were important, as their fellow graduates held key positions in the French state administration and industry. *Polytechniciens* provided essential expertise for the new company to construct and produce a full range of punched card machines, and their profession explains both why they became attracted to the punched card trade through their professional interest, and their professional network became a key to establish contacts both to capital providers and customers. From late 1931, the nascent company was assisted by two *polytechniciens*:

Georges Vieillard and Elie Doury. From 1928 to 1929, they had tried, in vain, to establish production in France of Remington Rand=s American Powers machines.[21] After that had failed, they jumped to assist the newly established Egli-Bull company. Their jump from one opportunity to establish a punched card production in France to another had a French nationalistic undertone. As head of the operations at Bull, Vieillard, during the next two years, increased the company=s Frenchness by obtaining a majority of French share capital through an expansion in the total share capital, and the nationalistic dimension was manifest in the already mentioned exchange of views with Thomas Watson of IBM in Paris in 1935, as reported by Vieillard many years later. Further, Vieillard was instrumental in admitting the Bull company to the Association of French Industrial Producers (*Confédération Générale de la Production Française*), which distinguished Bull from the foreign-based competitors, the IBM subsidiary and SAMAS.[22]

The *polytechniciens* cooperated with a group of French army officers of the line, united through their common professional interest in industrial production. The first officer to appear was lieutenant colonel Emile Rimailho who was as a member of Bull=s board of directors between 1931 and 1937, and chairman between 1931 and 1934. Rimailho was a distinguished French artillery officer who had contributed to the design of a 75mm gun and, subsequently, had moved into industry, where he became a specialist in scientific management - hence his interest in office mechanisation. Jacques Cailles was his successor from 1935 as chairman of Bull=s board of directors, a former officer from the Ecole Spéciale Militaire of Saint Cyr. Jacques Cailles represented the owners of the Aussedat paper works in the Bull company.[23]

René Carmille was the third key officer in relation to the Bull company, but he remained employed outside the company. He graduated from *École Polytechnique* and entered the artillery commencing a thirty-year carrier in the French army. He distinguished himself during the First World War and served in the French Rhine Army. From 1924, he worked in the *Corps du Contrôle de l'Administration de l'Armée de Terre*, and rose to become its head in 1936.[24] This *corps* had roots back to the seventeenth century, and it was an instrument to

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[21]. Dominique Pagel interviews with Georges Vieillard (1973) and Elie Doury (1972), in Bull Archives, boxes 94HIST-COM03 nos.1, 3.

[22]. Board meeting minutes, 20 December 1931 and 31 March 1933, box 93DJFG-DDS02, No. 1, Bull Archives.

[23]. Mounier-Kuhn 1989, p.282, 284.

[24]. Gaston Marie, "René Carmille. Son oeuvre" [obituary], *Journal de la Société de statistique de Paris* 86

control the French army=s expenses. In the inter-war period, it was a part of the army but it was also responsible to the national government. The *corps*= responsibility was both to control expenses and to promote efficient administration. A key assignment was to control the costs of the industrial artillery establishments.[25]

In 1931 or 1932, René Carmille became interested in using punched cards, as he studied ways to control the expenses at the artillery workshops. As a *polytechnicien*, he was influenced by the stories of rationalisation propagated by his fellow engineers, in their key roles in the diffusion of rationalisation in industry from the 1920s. In 1932, IBM machines were selected to control expenses at the national weapons factory in Puteaux, near Paris. Control was improved by use of frequent statements of the budgetary accounts. During the 1930s, the Puteaux factory maintained its IBM installation, which was extended to include additional assignments and machines.[26]

Between 1934 and 1937, the army established five additional, similar punched card installations for army operational statistics. In contrast to the Puteaux installation, they all were based upon equipment from the Bull company. This shift from IBM to Bull as a French army supplier was an outcome of the success of the Bull company in building an efficient business network, based upon the existing network of *polytechniciens* and its membership of the Association of French Industrial Producers. Carmille was the key agent in this shift, and he became a core supporter of the Bull company. In June 1935, Carmille advised the government to make a substantial direct investment in the company,[27] which had financial problems to a significant degree due to their difficulties in producing well-functioning machines.[28] Carmille=s investment proposal did not materialise, but, later the same year, he

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(1945), p.145-148; [Robert Ligonnière], "Petite histoire des statistique@, *Ordinateurs*, 25 November 1985, p.44-48; Jean-Pierre Azéma, Raymond Lévy-Bruhl and Béatrice Touchelay, *Mission d'analyse historique sur le système de statistique français de 1940 à 1945,* Paris, 1998, p.11-12.

[25]. Jean Delmas, AL=organisation militaire en France - l=armée@, in *Histoire militaire de la France,* vol.2 (1992), p.429-430.

[26]. Heide, forthcoming.

[27]. René Carmille, ARapport Particulier, No. 72: Fabrications de machines à statistique et situation particulière de l'industrie française en cette matière@, 11 June 1935, 31-40, 60-63, folder 6, box 8 N77, Serie N, ASHAT; minutes, "Resume de l'entretien de M. Vieillard avec M. le Contrôleur Carmille, et M. Essig, Inspecteur des Finances", 23 January 1935, and "Note pour M. Jourdain en vue de l'entretien avec M. Guinant, secrétaire Général du Ministère de la Guerre", 24 January 1935, folder DAC I 193/51, box 92 VEN 08-1, Bull Archives.

[28]. Board meeting minutes, 19 February 1934 and 25 February 1935, box 93DJFG-DDS02, No. 25, Bull Archives.

resolved to acquire Bull equipment to control army transport expenses, in spite of the recommendation from the office processing those expenses to purchase IBM machines, which they considered technically superior.[29]

But national preferences were not mandatory. In 1935, René Carmille started to develop the scope of the punched card applications at the army=s explosives establishment in Sevran-Livry, near Paris. Carmille=s objective went beyond operational statistics to include the bookkeeping of weekly payment of wages. Since the start of the first army installation at Puteaux, in 1932, the punched card producers had improved the capability of their machines. Most important, the machines had become alphanumeric (that is, they included a full alphabet and printed combinations of numbers and letters). The new application was based upon the IBM punched card standard that requested Sevran-Livry to acquire some IBM machines complementary to their Bull installation.[30] The Sevran-Livry application for wage administration was a bookkeeping system based upon the machines= ability to add various wage components, subtract deductions and, particularly, print lists with names and diverse figures, as well as a receipt with the wage earner's name and the amount to be paid.[31] Probably, the IBM machines were selected, in spite of being American, as Bull only supplied a subtracting tabulator from 1936.[32]

Simultaneously, Carmille worked to improve the French army=s conscript and mobilisation administration, which would have provided substantial business to the faible Bull company. Managing a vast modern army of conscripts was a huge administrative task. First, the conscripts were called up and received their basic training. Then, they were transferred to the reserves, and the military had to keep track of them in order to prepare for exercises and for a mobilisation. The administrative task was complicated, as the conscripts remained in the reserves for sixteen years after their basic training. The size of this task is apparent from the fact that, at the outbreak of the Second World War in September 1939, 4.7 million Frenchmen

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[29]. René Carmille, ARapport Particulier, No. 78: Fourniture d'un équipement mécanographique au Service de la Liquidation des Transports@, 16 December 1935, 19, folder 6, box 8 N77, series N, ASHAT.

[30]. René Carmille, "Rapport Particulier, No. 71: Fabrications de machines à statistique qui peuvent être utilisées par les services du Département de la Guerre", 14 May 1935, 2-4; René Carmille, "Rapport Particulier No. 105 concernant le position de la Compagnie Bull vis-à-vis du Département de la Guerre," 11 March 1938, p.18; both in folder 6, box 8 N77, series N, ASHAT.

[31]. R. Carmille, *La mécanographie dans les administrations*, 1st ed. (Paris, 1936), 77-96.

[32]. "Rapport sur l'Atelier de Construction de la Compagnie des Machines Bull", 12 July 1936, folder DAC I 193/51, box 92 VEN-08-1, Bull Archives.

came under arms.[33]

Back in 1933, the conscript and mobilisation service started to study ways to mechanise this gigantic bookkeeping operation, taking into account where people currently lived, rather than their last contact address. The military wanted an improved distribution of personnel to the various units, and they wanted to be able to print the diverse mobilisation documents quickly. This assignment required the printing of various kinds of information on each soldier: his name, address, profession and unit.[34]

The mobilisation system could be improved, either through a punched card based system, or by using a combination of punched cards and address plates. Carmille found the exclusive punched card system the most advantageous. Two companies could provide equipment for this task: IBM and Bull. Bull was invited to provide machines for testing at the Versailles conscript administration office, which failed, in the summer of 1935, due to deficient machines.[35] Then, the army=s conscript and mobilisation administration developed a system based upon a combination of numeric SAMAS punched cards machines and address plates that was never implemented. The reason appears less to have been of opposition to the foreign producers than of lack of concern in the French army in improving their conscript and mobilisation administration. The Frech defeat to Germany in 1940 caused such concern, and a mechanisation of the mobilisation administration was implemented during the German occupation. Carmille was in charge of this project, and the Bull company defined the standards and it was the main supplier of punched card equipment.[36]

## Conclusions

The importance of national capital was manifest in the clash, in 1935, between Thomas J. Watson of IBM and the two Frenchmen, Jacques Cailles and Georges Vieillard, over the

[33]. Euginia C. Kiesling, *Arming Against Hitler: France and the Limits of Military Planning* (Lawrence, Kanses, 1996), 85-91; Henry Dutailly, "L'effondrement", Guy Pedroncini, ed, *Histoire militaire de la France* 3 (Paris, 1992), 382.

[34]. Note, "Affaire recrutement-mobilisation. Visite de M. Ch. au Bureau de recrutement de Rouen, le 8 Août 1935", folder 1, box 3.11, Bull Archives; Henry Dutailly, 349-350.

[35]. René Carmille, "Note No. 306"; René. Carmille, "Rapport Particulier No. 105" (n.25 above), 13; René Carmille, "Rapport Particulier, No. 68: Etudes de l'urtication de procédés mécanique mécanographique par les Centre de Mobilisation," 5 February 1935, folder 6, box 8 N77, series N, ASHAT.

[36]. Heide, forthcoming. IBM equipment was also applied due to the big size of the project, as the Bull company had a limited production capacity.

nationality of Bull company ownership. Approaching this story by use of a broader approach disclosed that the Cailles family could have had the less conspicuous objective of securing a big customer, of forward integration. Settling this question would require a study of all the investments by the Cailles family, and their closely related Michelin family, the owners of the Michelin car industry. This is not accomplished in this paper, but the case served to raise the questions of the national capital=s roles and mechanisms, which were approached through analysis of the interlinked networks of French army carrier officers and of *polytechniciens*.

The network analysis explained the mechanisms of national capital in the Bull company case. It explained why Georges Vieillard and Elie Doury found their way to the nascent Bull company and their dedication to assist. Further, network analysis explained the selection of the Cailles family as investors to the Bull company. Jacques Cailles was member of the army officers= network, where a fellow member, Emile Rimailho, was chairman of Bull=s board of directors. The interest of the Cailles family=s Aussedat paper mills in the Bull company as customer enhanced this link. Finally, the two networks provided the contact to René Carmille and the office mechanisation of the *Corps du Contrôle de l'Administration de l'Armée*. As the army cared much for the security of their supplies, the Bull company possessed an important asset of having the full development and production of their machines in France. Carmille=s position gave influence on many cases of office automation in the French national administration, which made him most valuable to the Bull company.

At the same time, the network analysis cautioned on several issues. It called attention to several examples of the choice of a foreign producer due to their superior products. This is notable, as an alternative would have been to build less sophisticated applications based upon exclusive French products, and these cases contribute to a balanced assessment of national preferences in France during the 1930s. Further, the investment of the owners of the Aussedat paper works in the Bull company disclosed the complex roles of national capital as an end and a means. Finally, network analysis enables the broadening of the focus from national capital into the much more subtle national preferences, which include protection of industry in a country through patent legislation and selective tariffs. National preferences had one role in the open nationalistic and somewhat autarkic 1930s, and their role changed as the economy became increasingly internationalised from the 1950s. But national preferences have remained an important issue that continues to raise debate and needs balanced analyses.