"Too Far Ahead of its Time": Britain, Burroughs and Real-Time Banking in the 1960s

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In 1969, BBC television's popular science and technology programme, *Tomorrow's World*, broadcast an item that looked forward to a banking system that would "usher in [the country's] cashless economy".[1] The show's narrative of technological change envisioned point of sale terminals in British high street shops linked in real-time to a central super computer. The basis for the show's prediction was a plan by Britain's biggest bank, Barclays, to introduce its new nationwide real-time computer banking system in time for 15 February 1971. Barclays was not alone. The Midland and the National Provincial also saw decimalisation day as the deadline for the real-time computerisation of the whole of their branch networks. The banks did not go so far as to include point of sale terminals in their plans, however, but each did foresee its own real-time computer linked to a national branch network of intelligent terminal satellites. In each case it was US computer manufacturer, Burroughs, that was to provide the banks' real-time systems.

Not untypically for *Tomorrow's World*, its prediction turned out to be wildly optimistic. But so too were the ambitions of Burroughs and the banks. At the time of the

[1] BBC, "Computerised Banking Ushers in a Cashless Economy", *Tomorrow's World*, first broadcast 9 December 1969, available from: http://www.bbc.co.uk/archive/tomorrowsworld/8012.shtml

programme's broadcast, one bank had already abandoned its plans, and relations between the other two and Burroughs were being sorely tested. Real-time banking never materialised in the 1970s, let alone by 1971, and to varying degrees each project could be considered a failure.

In this paper I examine the details of the Barclays' case and its relation to the real-time cashless ideal. Drawing upon oral testimonies and archival material, I offer Barclays' perspective on the Barclays-Burroughs project to show how a community of practice made up of Barclays programmers and Burroughs engineers struggled to make the rhetoric of the cashless society a real-time banking reality. I explore the co-construction of real-time computing and its "interpretive flexibility" as "real-time" became "on-time" in the face of a number of material and immaterial difficulties. These difficulties – environmental challenges at the computer centre, delivery delays, cancellations and manpower shortages – exacerbated the challenges of software creation and resulted in the project's eventual demise. I conclude by considering how both the community of practice on the ground, and those responsible for the cashless society rhetoric in the air, came to terms with the project's unfortunate end and re-incorporated it into the prevailing technological discourse. The technology of real-time computing for banking and the idea of the cashless society was something that, in retrospect, both parties considered something "too far ahead of its time".

Barclays and the real-time impetus

Of all the British banks in the 1960s it was Barclays that most wanted the title of technological innovator. It opened Britain's first computer centre for banking in 1961,[2]

[2] For an analysis of Britain's first computer centre for banking see the forthcoming (October 2010) chapter, Ian Martin, "Britain's First Computer Centre for Banking: What Did This Building Do?" in *Technological Innovation in Retail Finance: International Historical Perspectives*, Bernardo Bátiz-Lazo, Carles Maixé-Altés, and Paul Thomes, eds. (Routledge, 2010), 37–70.

and its launch of Barclaycard, an Anglicisation of Bank of America's BankAmericard, was the country's first introduction to the consumer credit card. As part of the marketing campaign for Barclaycard, Barclays began to play upon notions of a cashless society. In advertisements in the British press (see Figure 1), it looked forward to the day when "sophisticated communities" would no longer need to rely on cash, which it considered was money in its most "troublesome form". Barclaycard's new sharp plastic edge was shown cutting through coins that were the "metal tokens" belonging to a primitive inefficient society. Barclaycard was positioned as a necessary next step that followed cheques in the inevitable evolution towards a cashless future.

Figure 1. Barclaycard advertisement, 1966. Source: "Barclays are deeply committed to Barclaycard: Why?" [display advertising], *The Times*, 15 July 1966.

Barclaycard, however, like branch accounting at Barclays' first computer centre, relied on a computer system that processed customer account updates in batch. Batch processing of branch accounts delayed the updates received in batches from branches throughout the day until they could be processed in branch and account order at the centre later the same evening. Printed lists of updated accounts in the form of ledgers and statements were then made available to the branches by the following morning.

Whilst the computer itself processed information very quickly, the move from mechanised accounting in the branch to computer accounting at the centre increased overall processing times. Real-time computing offered the possibility of banishing this delay.

Military applications had provided a need for real-time computing, and the reservation systems of major American and British airlines had proved its commercial viability. Like SABRE, real-time computing for the banks could offer immediate updates and information retrieval, and providing improved management information and business control.[3] In banking, however, the application of real-time computing was still a global frontier. The cachet of realising the world's first real-time banking system appealed to Barclays, and a draft internal memo revealed concern from an unnamed source that the bank was in danger of losing its pioneering position at the head of the British banks.[4] A fully-integrated real-time computer system comprising of a network of branch terminals linked to a computer at the centre promised to regain Barclays' lost status as a computing pioneer. The impending decimalisation of British currency precipitated Barclays towards real-time.

The issue of decimalisation had been raised many times in Britain. As far back as 1831 Charles Babbage had sought to rationalise another aspect of banking when he proposed a three-step plan for decimalisation to the British government.[5] This came to nothing, but the debate rumbled on finally coming to a head by the early 1960s as one-by-one the former constituents of the British Empire announced their own decimalisation plans. In his budget of 1966 the Chancellor of the Exchequer, James Callaghan, had announced that Britain would convert to decimal currency.

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[3] Alan Booth, *The Management of Technical Change: Automation in the UK and USA since 1950* (Palgrave Macmillan, 2007), 150–151.

[4] Barclays Group Archive (hereafter BGA)/758/32, "Suggested Basis for Local Head Office Circulars to Branches", undated.

[5] Anthony Hyman, *Charles Babbage: Pioneer of the Computer (Princeton University Press, 1985)*, 113.

Decimalisation day, or "D-Day" as it came to be popularly known, was set for 15 February 1971.[6] The Chancellor's announcement gave the state, businesses, and the public five years to prepare for the change from pounds (£), shillings (s), and pence (d) into the new pounds and pennies. The new pound would continue to have the same value as the old, but would be divided into 100 new pennies.

The government's decision to finally press ahead with decimalisation meant a massive enforced change for all British businesses. Banks, in particular, were under tremendous pressure to get the conversion right. Decimalisation not only meant handling a new currency, but required wholesale changes to accounting procedures and technologies in the branches. In 1966, computerised branch accounting was localised and reserved for the biggest and busiest branches. Out of the 2,300 branches in its national network Barclays had automated less than 100. In the branches, accounting machines, adding machines, ledger books, customer statements and paper forms all required replacement or conversion. There were significant costs associated with the replacement or conversion of existing branch equipment, procedures and stationery for decimalisation, much of which would be redundant after computerisation.

In the computer centres too, accounting programs had to be rewritten and stationery had to be updated. However, decimal conversion of centralised computer centre branch accounting presented itself as a fairly quick and manageable task. The same programs at the centre did the accounting work for all branches; a change to these programs would change all the branches in one fell swoop.[7] Conversion of the accounting practices and equipment across an entire branch network was an altogether more complicated proposition. Given the complexity of change and the associated costs,

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[6] "Mr Callaghan's Budget Preview: 50m Gambling Tax to Finance 4¼ p.c. 'Option' Mortgages: Decimal Coinage in 1971", *The Times*, 2 March 1966, 8.

[7] One Barclays' manager was reportedly quoted in a newspaper that the computerised conversion could be done in *seconds*, Gerry Jarvis, interview with author, Macclesfield, 28 September 2008.

it made economic sense for the clearing banks to have computerised the accounting of as many of their branches as possible before decimalisation day.

Enter Burroughs: agent of the future

Barclays had initially planned an IBM installation for its fourth branch accounting computer centre. Barclays' relationship with IBM was well established by this time, but not everybody in Barclays was completely content. There were some documented problems with IBM's existing service,[8] and talk that their terminal units were regarded as unsuitable for Barclays' smaller branches. Other US office appliance manufacturers were also targeting the UK market intent on contesting IBM's hegemony as computer supplier to four out of the "Big Five" British banks.[9] Of these, it was US computer supplier, Burroughs, that stepped forward and sold three out of the "Big Five" its solution for real-time branch accounting.

Burroughs was a member of a group of IBM's seven biggest US rivals that the trade press had labelled the "seven dwarves" as an indication of their comparatively small market shares in relation to the US giant.[10] Burroughs' arrival in Britain pre-dated IBM's entry into the UK market by over fifty years, however. It had established its first sales office in Britain in 1895 and built its first manufacturing plant outside of the US in Nottingham three years later.[11] The company's entrepreneurial founder, William Seward Burroughs, had worked in a bank and knew only too well the tedious repetition

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[8] BGA/758/34, "Computers – Summary", undated.

[9] Booth, *The Management of Technical Change*, 151.

[10] Martin Campbell-Kelly & William Aspray, *Computer: A History of the Information Machine* (Basicbooks, 1996), 135–6. The dwarves were General Electric (GE), Radio Corporation of America (RCA), Sperry Rand, Honeywell, Burroughs, National Cash Register (NCR), and Control Data (CDC).

[11] James W. Cortada, *Before the Computer: IBM, NCR, Burroughs, and Remington Rand and the Industry they Created*, *1865–1956* (Princeton University Press, 1993), 37; Memorex, "Burroughs Traces Founding Back Nearly 100 years", *Memorex Intercom - A Special Intercom Issue on Burroughs Corporation*, December 1981, 1.

that characterised much of the work of the bank clerk. He began his company by developing an adding machine that he identified by personal experience as fulfilling a need in the branch book-keeping process. The company went on to produce a series of machines that fulfilled a succession of banking needs.

After World War II Burroughs invested significantly in electronics and began to expand vigorously. It opened new factories in the UK and relocated its adding machine production facilities from Detroit to Strathleven, Scotland.[12] In 1950 its investment in electronics had resulted in production of a new kind of branch accounting machine called the Sensimatic, which it considered "the greatest advance in accounting machines in 25 years".[13] However in the 1950s Burroughs was slower than IBM in making the move from office equipment supplier to business computer supplier. Its first vacuum tube based machines only sold modestly in the 1950s,[14] and its business computing efforts were largely focused on selling equipment that could fit within the confines of a traditional office environment. Of the ten "data processing" products it showcased at the Business Efficiency Exhibition in London in 1959, its 220 "large-scale computer" was the only one that would find a home in a computer centre.[15] In contrast to IBM, Burroughs had not been a manufacturer of the tabulators that had acted as a useful stepping stone in the transition from office appliance manufacturer to business computing manufacturer.

Nonetheless by the 1960s Burroughs had begun to make the transition. Like IBM, its first inroads into large-scale computing with the British Banks were via cheque sorter readers. Lloyds ordered a Burroughs cheque sorter-reader in 1960, and followed

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[12] Booth, *The Management of Technical Change*, 40.

[13] Memorex, "Burroughs Traces Founding Back Nearly 100 years", 2.

[14] Jeffrey R. Yost, *The Computer Industry* (Greenwood Publishing Group, 2005), 62.

[15] "Burroughs" [display advertising], *The Times*, 11 May 1959.

this up with an order for a Burroughs B270 computer in 1962.[16] The Midland ordered a total of ten Burroughs sorter-readers to be controlled by a Burroughs B370 by 1965.[17] Burroughs' cheque encoding machines, used in the branch to print the amount in magnetic ink on cheques paid in over the counter, had a three-quarters majority share of the British market.[18]

Burroughs took advantage of the close links it had forged with the banks to position itself as fulfilling a niche requirement in the business computing marketplace. In 1965 Burroughs stepped up its computer sales efforts to the British banks by expanding its London sales office and creating a "London-Banks" office dedicated to serving the needs of the clearing banks. Its sales team aggressively went after new business, seeking to persuade the banks to change commitments to existing computer suppliers and instead buy Burroughs. Burroughs competed simultaneously on four fronts. First, it competed on price, offering to undercut the competition. Second, it levered its long-standing links with the British banks to promote itself as fully understanding their specific needs. Third, it competed on technical excellence, waxing lyrical about the virtues of its integrated hardware and software developments.[19] Fourth, it was intent on selling itself as the business automation company of the future, declaring in advertisements in newspapers and trade journals that it was "bringing business automation to far-sighted companies".[20]

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[16] Lloyds Bank Group Archives (hereafter LBGA)/Winton File: "Computers, Howland 2.11.77"; "Lloyds Bank Order £120,000 Computer", *The Times*, 13 November 1962, 21.

[17] "Further Automation by Midland Bank", *The Times*, 1 February 1965, 20.

[18] Anthony Harris, "How Burroughs got £20m out of the Banks", *Financial Times*, 7 April 1967, 13.

[19] Gerry Jarvis, interview with author, Macclesfield, 26 September 2008; David Parsons, interview with author, Manchester, 7 August 2008.

[20] Booth, *The Management of Technical Change*, 41; Anthony Harris, "How Burroughs got £20m out of the Banks", *Financial Times*, 7 April 1967, 13. Quote from Burroughs advertisement in "Banking: A Financial Times Survey", *Financial Times*, 22 May 1967, 24.

Barclays had little in the way of a pre-existing relationship with Burroughs, preferring to do business with NCR for its branch equipment,[21] but Burroughs extolled the virtues of its intelligent TC 500 terminals for the branch and its B8500 computer in the computer centre. This was a combination that it promised would be powerful enough to handle the bank's entire branch accounting needs.

The B8500 Computer

Burroughs had gained its initial real-time experience working as a subcontractor on the SAGE project and a number of other US government sponsored projects. To the private sector, it marketed its 500 series machines as on-line and real-time systems particularly suited to financial applications.[22] The range began with the entry-level B5500, the commercial counterpart of its D825 military real-time machine. At the top of the range was the B8500 supercomputer. Produced by the Burroughs Defense, Space and Special Systems Group, the B8500's origins were as a high-speed scientific computer for the US Atomic Energy Commission. It shared the integrated modular design found in the B5500, expanding the concept further to offer a maximum of 16 interconnected processors and I/O modules.[23] The B8500 represented Burroughs' biggest and most ambitious system to date, which Burroughs set about marketing outside of the defence and space fields, trumpeting it as "the most powerful computer system ever designed".[24]

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[21] Gerry Jarvis, interview with author, 28 September 2008.

[22] Martin Campbell-Kelly, *ICL: A Business and Technical History* (Oxford University Press, 1999), 23; BGA/725/3, Alan Duncan, interview with Jessie Campbell, 11 August 1998.

[23] Burroughs Corporation Defense, Space and Special Systems Group, "B8500 Information Processing System", c. 1966.

[24] George T. Gray and Ronald Q. Smith, "After the B5000: Burroughs Third-Generation Computers 1964–1980", *IEEE Annals of the History of Computing* 31, no. 2 (2009): 48; Burroughs Corporation, "Burroughs B2500 and B3500 Electronic Data Processing Systems: A New Level of Computer Responsiveness", March 1966.

In addition to the American defence contract, Burroughs already had a $20 million order from US Steel and a $15 million order from the University of Wisconsin.[25]

Burroughs demonstrated the machine's technical pedigree to senior Barclays analysts and programmers who were invited on tours of Burroughs Research Unit in Detroit and installations at US Steel and the North American Air Defense (NORAD) combat operations centre inside the Cheyenne mountain near Colorado Springs.[26] At US Steel, Burroughs was building a B8500 to order to serve as a real-time control system. Although Barclays' representatives didn't know it at the time, the machine they saw "in bits on the floor" would never be a finished machine. US Steel continually changed its requirements and although Burroughs attempted to respond with modifications to increase processing power,[27] the machine was unreliable and Burroughs was unable to rectify its flaws cost effectively.[28]

At NORAD, Barclays' people were presumably flattered to have been granted privileged access, and most definitely impressed by what they saw inside. At the heart of the complex was a Burroughs computing behemoth, a D825 multiprocessor computer that used radar and satellite input to make real-time evaluations of incoming threats to the North American continent.[29] Its multiprocessor architecture meant that not only did it offer high performance, but that it also boasted non-stop capabilities with one processor providing backup for the other in event of failure. This was an important selling point for a complete solution that relied a single computer at its centre and Barclays' representatives judged the Burroughs machine to offer superior reliability in

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[25] "Computing Success", *Time Magazine*, 23 December 1966.

[26] Alan Duncan, interview with author, Snettisham, 23 September 2008.

[27] Gerry Jarvis, interview with author, Macclesfield, 26 September 2008.

[28] Gray and Smith, "After the B5000", 48.

[29] Memorex, "Burroughs traces founding back nearly 100 years", 1; Joyce A. Post, "The Burroughs Research Center in Paoli", *Tredyffrin Easttown Historical Society History Quarterly* 40, no. 1 (January 2003): 3–18.

comparison to its competitors.[30] The visiting team was also impressed by the synergy between Burroughs' hardware and software teams, of which one of the results was an automatic "self-discovery" of any changes in hardware configuration at Initial Program Load (IPL). Burroughs was judged by the Barclays technicians to be organisationally and technically very advanced and able to offer machines with superior technology and system reliability to those of the firm's competitors, particularly those from IBM.[31]

The TC 500 intelligent terminal

It was the appeal of Burroughs' programmable branch terminal, the TC 500, however, that led Barclays to its all-Burroughs solution.[32] The TC 500 offered an intelligent terminal interface to its operator within the branch, and was judged by one of its Barclays' programmers to be "streets ahead of anything else at the time".[33] Barclays programmers could write programs for the TC 500 which were stored on coloured paper tapes. An operator in the branch would load up different programs in order to perform different branch accounting tasks.[34] Figure 2 shows a Burroughs TC 500 in Burroughs' advertising literature of the time.

[30] BGA/725/3, Alan Duncan, interview with Jessie Campbell, 11 August 1998.

[31] Stan Gray, interview with author, Haslington, 22 July 2008.

[32] Gerry Jarvis, interview with author, Macclesfield, 26 September 2008.

[33] BGA/725/3, Alan Duncan, interview with Jessie Campbell, 11 August 1998; Peter Blackburn, telephone interview with author, 21 July 2008.

[34] Margaret Shilleto, telephone interview with author, 5 August 2008.

Figure 2. A Burroughs TC 500. Source: *Burroughs TC 500 Terminal Computer: Introduces a New Approach to On-Line Systems Design*, c. 1967, 2.

Burroughs had long been developing accounting machines for the banks, and they had become increasingly sophisticated. Its Sensimatic machine, launched in 1950,

incorporated a programmable control panel,[35] and headlines in Burroughs' advertisements declared it "A *Completely New* Accounting Machine". The copy underneath stressed its general purpose nature and suggested comparisons to a computer by describing it in terms of its "astonishing versatility" made possible by the incorporation of a "mechanical brain" which meant there was "no limit to the number of accounting jobs the Sensimatic [could] do".[36] In 1951, Burroughs had tried to convince the Bank of America to adopt modified Sensimatics as the heart of its ERMA system, but the bank turned down the proposal.[37]

Five years later, and the Sensimatic had evolved into the Sensitronic. Lloyds was the first British bank to make use of a Sensitronic for branch accounting in 1960. Equipped with two printing heads, it could print ledgers and customer statements simultaneously, and accounting information, including a customer account number and current balance, was also stored on three magnetic stripes on the back of the ledger card.[38] One press report remarked that a demonstration machine even glowed red when it reached an overdrawn account.[39] Use of the machines required internal use of account numbers within the branch, but Burroughs figured that the banks, already accustomed to ledgers as a visible record of accounting information, would not see this as prohibitive because the Sensitronic was making use of familiar "visible record" technologies: the ledger and the statement.

Burroughs' management understood that the technologies of office appliances and computers were converging.[40] In Burroughs' evolution of bank office equipment, the

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[35] Booth, *The Management of Technical Change*, 40.

[36] "A Completely New Accounting Machine" [display advertising], *Economist*, 18 October 1952.

[37] Amy W. Fisher and James L. McKenney, "The Development of the ERMA Banking System: Lessons from History", IEEE *Annals of the History of Computing* 15, no. 1 (1993), 49.

[38] "Lloyds Bank Electronic Accounting Machine", *The Times*, 4 July 1960.

[39] "Bank Machine Glows Red for Overdrafts", *The Times*, 1 July 1958.

[40] Franklin M. Fisher, James W. McKie, and Richard B. Mancke, *IBM and the US Data Processing Industry: An Economic History* (Praeger, 1983), 249.

TC 500s came next. Seen as the missing link between large-scale computing developments and office machines the TC 500 was Burroughs' intelligent branch terminal. Connected to a Burroughs large-scale computer a TC 500 could make "visible" to the branch in real-time the customer records at the centre. It was a sophisticated programmable electro-mechanical machine that had three processors and was considered to be a computer in its own right.[41] The *Financial Times* reported one claim that there was the same calculating capacity in this small office machine as there had been in an IBM 1401.[42] The TC 500's power was stressed in Burroughs' advertising literature as fulfilling an important contributing role towards a balanced computing system where processing was shared between remote terminal and central computer.[43]

A complete solution

Burroughs offered Barclays the computing capacity for its own real-time national computing network comprising a Burroughs B8500 at the centre and a network of Burroughs TC 500 terminals in the branches. It was a system that was claimed to be capable of providing an up-to-date response to any branch transaction within two and a half seconds, and able to handle a million of these transactions every hour.[44] Incredibly, Burroughs offered all this to Barclays for half the price of IBM's proposed £23 million solution.[45] Barclays dropped IBM in favour of Burroughs as the new supplier of the computing technologies that would decimalise the majority of its branch accounting. On 2 March 1967 it placed an £11,500,000 order with Burroughs for one B8500, priced at £4.5 million, and 2,300 TC 500 branch terminals.[46]

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[41] David Parsons, interview with author, Manchester, 7 August 2008.

[42] "D-Day Ushers in the Mini-Computer", *Financial Times*, 21 April 1969, 29.

[43] Burroughs, *Burroughs TC 500 Terminal Computer: Introduces a New Approach to On-Line Systems Design*, c. 1967, 2.

[44] "Business Notes", *Communications of the ACM* 10, no. 5 (1967): 330.

[45] Ackrill and Hannah, *Barclays*, 332–334.

[46] "Barclay [sic] £11½m. Computer Buy", *The Times,* 30 March 1967, 15.

Barclays' order was then quickly followed by one from the National Provincial. In February the following year both banks were followed by the Midland, which was experiencing difficulties in its relationship with English Electric Leo Marconi.[47] Three out of the British "Big Five" banks had switched to Burroughs as their computing supplier and were intent on realising real-time automated branch accounting in time for decimalisation. The other two big British banks, Lloyds and the Westminster, stayed committed to IBM, and, to differing degrees, committed to batch processing. Burroughs, proud of its coup, made sure the rest of British business knew about it. Figure 3 shows an advertisement it published in the *Financial Times* of 22 May 1967, following the orders.

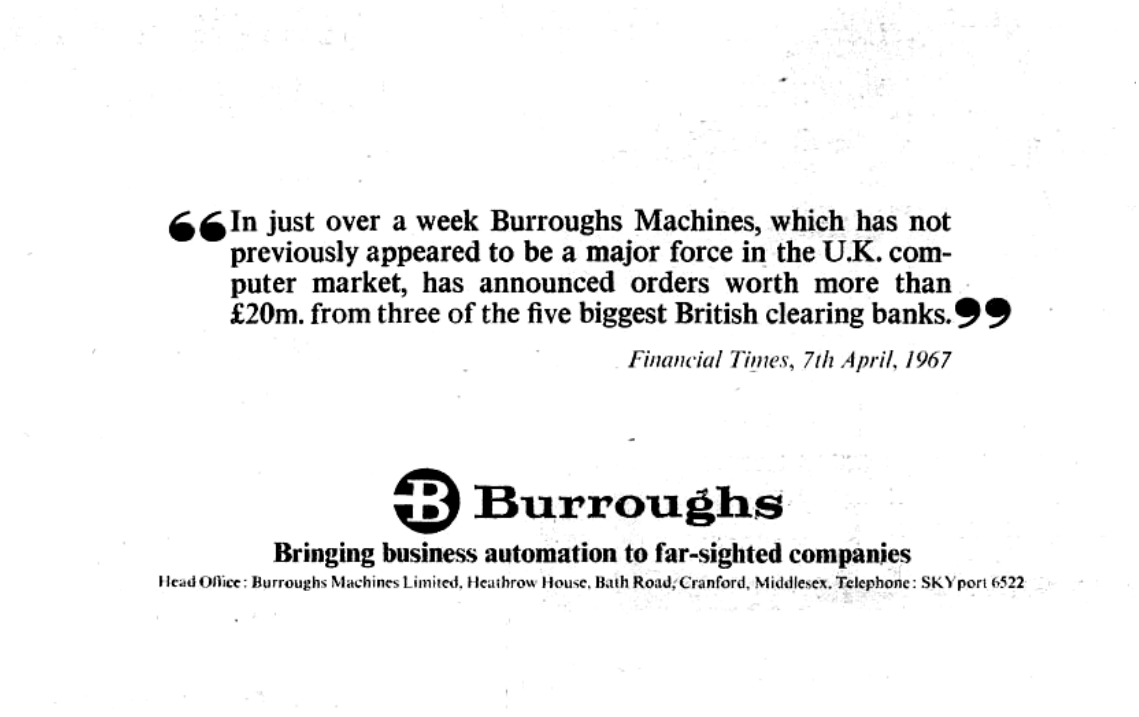

Figure 3. Burroughs advertisement published in a banking supplement of the *Financial Times*, 22 May 1967.

[47] The Midland placed an order of £5m for two Burroughs B6500 computers, see Kenneth Owen, "Blow for Computer Merger", *The Times*, 24 February 1968, 11. It had already invested heavily in Burroughs equipment for the branches.

Although Barclays had done little business with Burroughs up until this point, preferring to partner with NCR for its branch accounting equipment,[48] this was not regarded as a significant issue. Barclays' first computing supplier had been EMI, and IBM had only recently begun to dominate as first-choice supplier to Barclays and the other British banks. The computing landscape was by no means clear, and Burroughs' real-time computing offered Barclays the opportunity to further its ambitions for the position of technological innovator, and do so at an affordable price. It reckoned its new system would be the largest real-time banking system anywhere in the world.[49] Now it was not just cash that was portrayed as outdated and dangerous as Barclaycard and *Tomorrows' World* had cast it, Barclays wanted the batch mode of computerised branch accounting to look decidedly old fashioned.

However, tomorrow's banking world was still years away. Lead times from order to delivery of large-scale computers were still typically eighteen months to two years, and installation of the Burroughs' B8500 super computer was promised for the first half of 1969.[50] Barclays saw nothing unusual in such a wait, and in the meantime looked for a space to house the new computer.

There was no need to wait for the delivery of the Burroughs large-scale computer to make use of the TC 500s, however; the branch terminals could operate as standalone book-keeping machines capable of being used for both £sd and decimal working with some reprogramming.[51] The bank was intent on replacing the non-decimal NCR 160 and 3204 accounting machines in the branches with TC 500s as fast as Burroughs could make them available.[52]

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[48] Gerry Jarvis, interview with author, Macclesfield, 26 September 2008.

[49] Ackrill and Hannah, *Barclays*, 333–334.

[50] "Business Notes", *Communications of the ACM* 10, no. 5 (1967): 330.

[51] BGA/758/32, "Suggested Basis for Local Head Office Circulars to Branches", undated.

[52] BGA/758/34, "Computers – Summary", undated.

Close to the machine

In the spring of 1967, Barclays began assembling a team of analysts and two programming teams that would realise its real-time banking vision. The first of the two programming teams was an applications team that would write the real-time branch accounting applications. The second was a small technical team assembled, in the words of one of its members, in order to "get to grips with [the B8500] in its technical glory". This team was made up of the bank's most experienced and skilled programmers drawn from other Barclays' computer projects. Appointed team leader of this team was programmer of the batch branch accounting programs at the bank's second and third computer centres, Stan Gray. Gray brought with him a colleague who had worked alongside him programming the IBM System/360. They were joined by David Parsons who had cut his programming teeth on the EMIDEC machine at the bank's first computer centre. These men, who were bank clerks five years previously, were now the bank's expert programmers and were complemented by a number of computing outsiders recruited for their technical specialisms. Fresh from Barclaycard was the bank's first computing outsider, Alan Duncan, who, as the bank's chief systems analyst, was in overall charge of the real-time banking project.[53]

The technical team's brief was to understand what could be done with the Burroughs machines by working "close to the machine" and advising the applications team accordingly. The machines the team had to understand were both the Burroughs large-scale B8500 computer and the smaller-scale TC 500s that would be installed in the branches. Getting close to the B8500 presented a considerable challenge as the machine would not be ready for delivery for another two years.[54]

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[53] David Parsons, interview with author, Manchester, 7 August 2008.

[54] Ibid.

Learning in a community of practice

Meanwhile, in the first half of 1968, one of the applications programming team attended a CUBE (Cooperating Users of Burroughs Equipment) meeting in New Orleans. CUBE was a computer user group for Burroughs' customers similar to SHARE, set up by the scientific and technical users of IBM computers, and GUIDE (Guidance for Users of Integrated Data processing Equipment), an association of commercial data processing users. Its purpose, like SHARE and GUIDE, was to share knowledge, ideas, practices and programs and to develop standards.[55] It was a formal incarnation of what educational theorist Etienne Wenger would consider a "community of practice".[56] At the meeting, a Burroughs' representative shared his knowledge that the B8500 was in delay and Burroughs was about to offer Barclays two B6500s as a temporary solution. Not only was this interim solution less than satisfactory, the manner in which it had been communicated to the bank was deemed wholly inappropriate. Barclays' senior managers regarded as disrespectful Burroughs decision to relay something of this magnitude to a chief programmer at a user group meeting rather than communicating it directly to them was seen as disrespectful.[57] As a stopgap and peace offering until delivery of the first of the B6500s, Burroughs supplied Barclays with a B5500 machine which shared a similar, if not truly compatible, modular multiprocessor architecture

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[55] For more on CUBE, see David Alan Grier, "Working Class Hero", *Computer* 40, no. 5 (2007): 8–10. For corporate collaboration and voluntarism in SHARE, which was generally capitalised by its members but is not an acronym, see Atsushi Akera, "Voluntarism and the Fruits of Collaboration: The IBM User Group, Share", *Technology and Culture* 42, no. 4 (2001): 710–736. For GUIDE, see Deborah Sojka and Philip H. Dorn, "Magic Moments in Software, *Datamation* 29, no. 9 (1981): 7–16 cited in Richard Hull, *In Praise of Wimps: Social History of Programming – Some Work in Progress – Including a Chronology and an Extensive Bibliography* (Alice Publications, 1992).

[56] For an introduction see Etienne Wenger, *Communities of Practice: Learning, Meaning and Identity* (Cambridge University Press, 1998).

[57] Brian Hull, interview with author, Wilmslow, 21 October 2008.

with the B8500 albeit on a much smaller scale. Barclays might not have been happy, but its programmers were at least able to begin testing.[58]

The B5500, like the B8500, was new to the UK market and there was little British experience. Barclays' technical team began working closely with Burroughs' engineers, forming a smaller, tightly-knit community of practice, to quickly gain experience of the machine's capabilities. The team soon realised both the B5500 and the TC 500s were sophisticated machines, but that Burroughs had not yet worked out how they would work in harmony as a real-time system. Telecommunications between multiple processors in multiple terminals connected over multiple lines to a multiprocessor computer wasn't catered for in the B5500's operating system. The real-time systems up to this point – including those from IBM as well as Burroughs – had made use of dumb rather than intelligent terminals. The sophistication of the TC 500 added an extra layer of complexity with which Burroughs and Barclays had to deal. Then exploded a first bombshell. The Burroughs' engineer who was to design and write the software for data communication between the TC 500s and the B5500 computer left Burroughs. Burroughs had nobody else available to replace him.

The Burroughs' programming job was picked up in 1968 by Barclays' David Parsons, a former bank clerk turned EMIDEC computer programmer at Barclays first computer centre. His new team leader, Stan Gray had faith in him picking up the challenge of getting the TC 500s to communicate effectively to the B5500 computer. The branch accounting programmes for the EMIDECs and the IBM System/360s at the banks other computer centres had been written in machine code and Assembly language. The application programs for the new Burroughs real-time branch accounting system were to be written in COBOL, which was supported by the B8500, but in order to get the TC 500 machines in the branch to communicate with the central computer required coding

[58] BGA/758/34, "Computers – Summary", undated.

at a lower level. Although the B8500 and B5500 were in the same Burroughs "family" of computers, they were not machine-language compatible like IBM S/360; compatibility was achieved through the use of higher-level languages.[59] All of the system software for the B8500 was written in ALGOL (ALGOrithmic Language).[60] It was ALGOL that David Parsons set about learning from the Burroughs-supplied manuals while Barclays waited for the installation of the Burroughs B5500 machine at Willesden. David worked with another computer specialist Barclays had recruited from outside the bank, Peter Atkins. The two shared a similar strong work ethic and were soon deeply immersed in the workings of the TC 500 and the B5500. One weekend the two of them took a complete program listing back to David's house in Barnet, North London and worked their way through it. They couldn't make sense of the logic behind the data communications, and working without Burroughs' support they decide instead to re-write relevant sections so they could understand it.[61]

They re-wrote what they could and then arranged for it to be typed up into punched cards the following week. Prior to one scheduled test session on the B5500, the two Barclays men approached Peter Groves, the Burroughs engineer responsible for the machine, and David Parsons remembers explaining the situation to him:

> You know we've been having trouble trying to make the telecommunications stuff work. Now Peter [Atkins] and I have written a whole new chunk of code for the operating system, and in our session this morning I'm going to recompile the operating system to our version. I know that means that because it's not Burroughs-written amendments, I get no support; so I don't expect any support. But I thought I ought to tell you that's what I'm going to do.[62]

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[59] Fisher, McKie and Mancke, *IBM and the US Data Processing Industry*, 245.

[60] John T. Lynch, "The B8500 from Burroughs", *Datamation* 11, no. 8 (August 1965): 49–50.

[61] David Parsons, interview with author, Manchester, 7 August 2008.

[62] Ibid.

The Burroughs' engineer is remembered as smiling and saying, "Don't be daft, of course I'll support you. Let's see how it goes." The three men worked together to recompile the operating system and then reinitiated the machine with test TC 500s in place. They started the test telecommunications programmes and a couple of seconds later the test TC 500s started to chatter. The informal collaboration between the Barclays-Burroughs team members had succeeded in getting the TC 500s to talk to the Burroughs computer. The bank's programmers experienced a sense of the mastery and exhilaration of programming close to the machine described by Sherry Turkle in *The Second Self* and Steven Levy in *Hackers*.[63] After the test, Parsons and Atkins submitted their changes to Burroughs so that their amendments could be incorporated formally into an operating system release. When the release was issued the programmers were proud of a comment in the B5500 master control program that acknowledged their contribution in supplying this code.[64]

The interpretive flexibility of "real" time

The TC 500s may have been talking to the B5500, but getting them to update customer accounts in "real time" was still a long way away. Challenges associated with real-time updating, including implementing restarts and recoveries, also had to be tackled. The real-time concept had been open to a number of different interpretations. On US military projects for flight simulation and air-defense it meant an immediate response without delay. For the SABRE project, "real time" was considered to be a response of less than three seconds and this was the paradigm used by the *Communications of the ACM* when it reported the newly announced Barclays-Burroughs system of being capable of

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[63] Sherry Turkle. *The Second Self: Computers and the Human Spirit* (MIT Press, 2004), 165–168; Steven Levy, *Hackers: Heroes of the Computer Revolution* (Penguin, 2001).

[64] David Parsons, interview with author, Manchester, 7 August 2008.

providing an up-to-date response to any branch transaction within two and a half seconds.[65] But pragmatic concerns led Barclays to interpret the real-time concept in a more flexible manner, which led to the design of a system that classified branch transactions according to one of three different levels, to provide an "on-time" rather than real-time response.

The first level consisted of enquiries and urgent amendments. If a clerk in the branch wanted to make an enquiry – a read-only request – this could be provided straight away. Certain update transactions, such as stopping a cheque, were classed as urgent amendments that also needed to be done straight away. The second level down consisted of daily branch accounting entries to customer accounts. These were accumulated and processed when the computer was not busy responding to immediate enquires or updates. The deadline for completion of all these entries on the computer would be the end of the day, as it had been in the branch. The third level was account amendments, for example change of address, for which there was no immediate urgency within the day. These were collected together and done all at the same time in a manner akin to batch processing.[66]

Progress was being made implementing the "on-time" design, but it was taking longer than planned and Barclays' programmers still faced a number of challenges. Meanwhile the computer centre was throwing up fresh challenges of its own.

A computer centre in suburbia

Barclays had quickly settled on an old motorbike warehouse at Harrow Road, Willesden in the North West of London for its Burroughs Computer Centre.[67] Located five miles to the north west of the City of London, see Figure 4, the centre lay at the beginnings of a

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[65] "Business Notes", *Communications of the ACM* 10, No. 5 (May 1967): 330.

[66] Gerry Jarvis, interview with author, Macclesfield, 28 September 2008.

[67] Barclays Bank, "The Story of Gloucester", *Barclaynews,* 1979, 4.

suburban sprawl that in 1924 the Metropolitan Railway had dubbed "Metro-land" to promote suburban development along its extended London underground Metropolitan Line.[68] At 51,000 sq. ft., the computer centre was Barclays' biggest yet, and its first in a suburban as opposed to urban location. The area was home to a mixture of the light industrial and the residential and consideration had to be given to adequate sound proofing in the centre's design lest noise from its standby diesel generator might disturb residents sleeping nearby.[69]

Figure 4. Detail from a Barclays map of North London showing the position of the Burroughs Computer Centre in Willesden (numbered 4) in relation to Barclays' three previous branch accounting computer centres, c. 1968. Numbering and a scale indicating approximately 1 mile added. All other annotations are original. Source: BGA/B547, *A Map of London Showing the Branches of Barclays Bank Limited*, 1964.

It wasn't the centre's impact on its environment that would be Barclays' main concern, it was the impact of the environment on the centre. Barclays had experienced problems providing the right conditions for its large-scale computers previously, space having been reclaimed from shops, factories and warehouses. The cheque clearing system at St Swithin's House consisting of an IBM 1401 and associated cheque readers had

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[68] Peter Clarke, *Hope and Glory: Britain 1900-2000* (Penguin, 2004), 149.

[69] "Keeping it Quiet", *Financial* Times, 24 November 1970, 11; Barclays Bank, "The Story of Gloucester," *Barclaysnews,* 1979, 4.

experienced "all sorts of faults […] because the electric switches on the building's lifts were interfering with the system."[70] But this was nothing compared to the problems Barclays experienced with the Burroughs' equipment installed at Willesden.

The Burroughs' computers and disk drives suffered innumerable problems. It was difficult to distinguish whether these problems were inherent to the Burroughs equipment, or whether they were due to adverse environmental conditions. Many pointed a finger at the computer centre's location, sandwiched as it was between a main road at the back and a busy railway junction in front. Vibrations from fully loaded freight trains running past at night could be felt throughout the centre. The Burroughs' machines were considered "very sensitive" by workers at the centre and the building's vibrations were blamed for a host of failures.[71] There was also a suspicion that other environmental factors, including dust from the road and rail traffic and less than adequate air conditioning, might have been at play.[72] Barclays continued to make modifications, including rubber damping for the computer floors, to cater for the site's inadequacies,[73] but it was soon clear that the building's location, and its repurposing from motorcycle warehouse to computer centre, had made for a computing environment that was far from perfect.

The TC 500s in the branch were not without their issues either. Operating as standalone book-keeping machines they were initially slower and more troublesome than the older machines that they replaced.[74] They were also prone to breakdown within the first three months. Barclays' project team advised branches that a "running in

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[70] BGA/725/3, Alan Duncan, interview with Jessie Campbell, 11 August 1998.

[71] BGA/754/31, David Bound, interview with Janet Sykes, 19 October 1990; Derek Finnis, interview with author, North Rode; David Parsons, telephone interview with author, Manchester, 7 August 2008.

[72] Roger Jefferyes, telephone interview with author, 3 August 2010.

[73] Jean Perkins, interview with author, 28 July 2008; John Evans, interview with author, Congleton, 22 July 2008.

[74] Margaret Shilleto, telephone interview with author, 5 August 2008.

period" of ninety days was required after which the breakdown rate settled down within acceptable limits.[75]

The first branches to be connected to the Burroughs machine at Willesden, in August 1969, suffered terrible processing delays. "On-time" processing was carried out in parallel to the branches' normal book-keeping, but it was far from "on-time". The B5500 computer was having difficulty operating in batch update mode only, and at one point rumours circulated at the GLCC that colleagues at Willesden were doing well as they were "only 8 days behind with their processing".[76] A friendly rivalry was developing between the bank's Greater London Computer Centre (GLCC) – its IBM computer centre at Tottenham Court Road – and the Burroughs computer centre at Willesden. Some in the Burroughs' real-time camp began to wonder if there was more than schadenfreude occurring at the GLCC, as rumours began to circulate that IBM was using Burroughs' misfortune to its own advantage in order to plot Burroughs' downfall.[77] This would not have been the first time accusations of this sort had been levelled at IBM. The FUD (fear, uncertainty and doubt) factor was an effective weapon employed against IBM competitors.[78]

Then, to make matters worse, what was seen as an interim solution became the only solution as Burroughs pulled the plug on the B8500 project and its offer of two B6500s became the only offer on the table. The B6500 now became the company's flagship machine as it now billed it as its "System for the Seventies". Burroughs had a backlog of 60 firm orders for the B6500, worth a total of $300 million, but it promised Barclays and the Midland that they would be amongst the earliest to receive this

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[75] BGA/758/34, "Computers – Summary", undated.

[76] Brenda Baker, interview with author, 28 July 2008.

[77] Roger Jefferyes, telephone interview with author, 3 August 2010; BGA/275/3, Alan Duncan, interview with Jessie Campbell, 11 August 1998.

[78] The "FUD Factor" was coined in 1975 by former IBM employee, Gene Amdahl, who left to set up a competitor company making IBM compatible computers. See Richard Thomas DeLamarter, *Big Blue: IBM's Use and Abuse of Power* (Macmillan, 1986), Chapter 15: "The FUD Factor".

system.[79] Nonetheless, it could offer no better estimate than the first of Barclays' two machines being ready for delivery in June 1969. With significant investment already made in the project, Barclays was not about to give up and pressed ahead and accepted Burroughs offer of the two B6500s. Burroughs also attempted to broker the same deal with the National Provincial, but this bank pulled out of its commitment to Burroughs large-scale computer, in part due to its impending merger with the Westminster bank which had invested heavily in IBM. The new National Westminster bank would go forward with a hybrid of IBM computers linked to Burroughs' terminals. The Midland, like Barclays, persevered with an all-Burroughs solution.[80]

Real-time dystopia

When initial plans for the real-time project had been drawn up mid-way through 1967, project managers had hoped to link the first branches to the Burroughs machine by August 1969. After this first milestone was reached, they anticipated rolling out real-time automation to the remainder of Barclays' branch network by the end of 1970. However, an announced merger with a smaller bank, Martins, in 1968 added a further 732 branches to Barclays' 2,612.[81] It was clear that it would be impossible to accommodate these extra branches into existing real-time plans.[82]

Side-stepping the challenges thrown up by the merger and in spite of the problems thus far, Barclays remained optimistic that the original project plan was achievable. In spite of teething troubles, connection of the first two branches, Watford Junction in Luton District and Chorleywood in Oxford District, to the Burroughs B5500

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[79] BGA/758/34, "Burroughs Reports", December 1969.

[80] Ted Schoeters, "1971 Target for Computer Networks", *Financial Times*, 20 October 1969, 14.

[81] Ackrill and Hannah, *Barclays*, 182.

[82] Ted Schoeters, "Barclays D-Day Computer Plan Suffers Serious Setback", *Financial Times*, 27 February 1970, 23. Further ramifications of the Barclays and Martins merger are considered in more detail in the following chapter.

computer at Willesden on 9 August 1969, provided the team with a much-need boost. But a number of other teething problems caused those in charge of the project to admit that the branches' initial experiences of the new system were bad. The two branches continued to run their mechanised in-branch book-keeping in parallel with the new system as Barclays worked with Burroughs to try and iron the problems out.[83]

Amidst the environmental problems at Willesden, and the challenges of programming for real-time, Burroughs announced that delivery of the first B6500 would be at first four, and then nine months late. It looked unlikely that Barclays would have its B6500 installed and working before October 1970. Burroughs promised Barclays another B5500 free of charge,[84] but as replacements for the B6500s the B5500s were woefully inadequate for the job. In comparison to the specifications for the never-to-materialise B8500 they were chronically underpowered. Barclays had connected eleven branches to the first B5500 and envisaged connecting only another twenty four more to that machine before it would be running at its capacity. A quick calculation estimated that Barclays would need a hundred B5500s to cope with all its branches.[85] Even with a B6500 installed and running by October 1970, Barclays' best estimate was that there would be fifty more branches on that machine before "D-Day". Whilst Barclays' programming manager insisted "[t]here is nothing wrong with the Burroughs system as such, and when installed it will provide us with the most up-to-date computer network in the world", it was clear that the project's deadline was not going to be met.[86]

The all-important "D-Day" for decimalisation was now cast as an interim milestone by which time all the branch accounting equipment not suitable for decimal conversion had to have been replaced with Burroughs TC 500s. Overall project

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[83] BGA/758/32, "Suggested Basis for Local Head Office Circulars to Branches", undated.

[84] Ibid.

[85] Gerry Jarvis, interview with author, Macclesfield, 26 September 2008; Brian Hull, interview with author, Wilmslow, 21 October 2008.

[86] BGA/758/32, "Suggested Basis for Local Head Office Circulars to Branches", undated.

completion was now shifted to the winter of 1971 with the technical team anticipating working flat out once the B6500s had been delivered.[87] With "D-Day" fast approaching, Barclays' main efforts were now redirected towards the IBM installation at the GLCC, where IBM personnel were only too happy to provide assistance and another S/360 machine.[88] Programmers supplied by CAP (Computer Analysts and Programmers) were brought in to begin work writing a version "2b" of Barclays' branch accounting programmes to run on the IBM mainframes. The new programmes improved the speed, capacity, reliability and security of the system, but updates to customer accounts would still be made in batch overnight.[89]

By decimalisation day, rather than acting as the hub for the whole of the branch network, the Burroughs computer centre at Willesden was serving only 30 bank branches and was limping along in batch mode rather than real-time. The Barclays-Burroughs relationship had gone sour, and Barclays' senior management were looking for a way out while trying to keep the bank's dignity intact. For a while Barclays kept the Burroughs B6500s - which were upgraded to B6700s - at Willesden, and attempted to get them to operate like IBM's S/360 machines. CAP produced an S/360 emulation programme for the Burroughs' machines, but predictably it ran slowly.[90] Plans to install any further large-scale Burroughs computers were shelved, and almost all effort was directed back into the well-established batch mode of working on IBM machine. Only a small programming team remained working on the Burroughs' real-time project.[91]

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[87] BGA/758/34, "Computers – Summary", undated.

[88] Gerry Jarvis, interview with author, Macclesfield, 26 September 2008.

[89] Brian Hull, interview with author, Wilmslow, 21 October 2008; Gerry Jarvis, interview with author, Macclesfield, 28 September 2008; "Barclays/CAP Team Builds Big Accounting Package", *Financial Times*, 3 September 1970, 13.

[90] Gerry Jarvis, interview with author, Macclesfield, 26 September 2008.

[91] David Parsons, interview with author, 7 August 2008; Gerry Jarvis, interview with author, Macclesfield, 26 September 2008.

Barclays was not the only British bank that suffered with Burroughs. The Midland suffered too. Its optimistically named "Project 70", later re-titled the "Online Computer System", was plagued with similar setbacks, but it persevered after Barclays had cancelled its project.[92] In the US, Trans World Airlines (TWA) was also experiencing major difficulties with Burroughs. The machines it had delivered to run its real-time airline reservations system were underpowered and unreliable. The Burroughs' system was never operational and TWA sued the company while it replaced its machines with high-end System/360 computers from IBM.[93]

Of all the big British clearing banks it was only Lloyds that managed to have all its branches connected on-line to a computer by decimalisation day.[94] Lloyd's achievement was significant, but Barclays' technicians were keen to point out that it wasn't the on-line *real-time* system to which Barclays had aspired.[95] Lloyds had decided to go for the more achievable goal of an on-line system where the branch was connected to the computer centre via telephone line and entries were made and stored on the computer during the day. Updates were still applied in batch overnight rather than in real time as the clerk entered them in the branch.[96] Lloyds' task was also made all the more manageable because it was the smallest of the "Big Five" banks both in terms of the size of its assets and the size of its branch network. And, of all the clearing banks, only Lloyds had chosen an all-IBM solution. It had remained faithful to IBM as its computer supplier all the way through the 1960s, and as result enjoyed some stability during a period of continual technical change. Unlike Barclays and Midland the stability of this relationship also provided for a long and continuous period of learning for those involved on both sides.

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[92] Gerry Jarvis, interview with author, Macclesfield 26 September 2008.

[93] Fisher, McKie and Mancke, *IBM and the US Data Processing Industry*, 246-247.

[94] Booth, "Technical Change in Branch Banking at the Midland Bank, 1945-1975", 295.

[95] Gerry Jarvis, interview with author, Macclesfield, 28 September 2008.

[96] Kenneth Owen, "British Bank Systems may be Model for US", *The Times*, 27 May 1969.

Closure

By 1972, Barclays' real-time project was beginning to look like a failure. What had to be done now was to construct it to be something else. On 15 December 1972, Barclays publicly announced that its remaining large-scale Burroughs computers were to be replaced by IBM machines.[97] Salvaging what it could from the project, Barclays didn't sever all links with Burroughs and the real-time project, however. It kept the technically elegant TC 500s in the branches linked to IBM computers at the GLCC and Willesden. This meant that, in part at least, the project could be considered a success. The majority of the money Barclays had invested in the real-time project had been on the TC 500 terminals in the branches and these remained, but now connected to IBM mainframes. They were fulfilling an important function for the bank, but not the real-time function that had originally been envisaged.

Barclays' merger with Martins in 1969 had increased the size of its branch network and the heterogeneity of its technology, exacerbating existing difficulties. However, it was also the merger with Martins that offered Barclays a way out of its predicament publicly with some semblance of grace. Amongst the external factors cited in an internal memo as responsible for the ongoing project delay was the merger between Barclays and Martins bank.[98] This internal memo formed the basis for Alan Duncan's public response when interviewed by the *Financial Times*. The newspaper reported Duncan as giving this explanation for continuing project delays:

[97] "Barclays Making a Major Change", *Financial Times*, 15 December 1972, 10.

[98] BGA/758/32, "Suggested Basis for Local Head Office Circulars to Branches".

> [T]he major setback could be traced to the merger with Martin's [sic] Bank. Prior to that merger, things were going smoothly and Barclays expected to have completed its huge 3,000+ branch network all linked to a giant Burroughs B-8500 computer costing £4m.[99]

Merger also offered Barclays final closure. Although from the outside the merger appeared to be a takeover of Barclays by Martins, on the inside there was a feeling of the reverse. In the computing division the merger was experienced as more of a takeover of Barclays by Martins.[100] Amongst those from Martins taking up senior positions in Barclays was the man with overall responsibility for breaking Martins' computing constraints in Liverpool, Warwick Broadbent. Broadbent was appointed head of Barclays computing department which by the end of the decade was approximately 200 strong.[101]

With a Martins' manager now in charge of the merged bank's computing division there was a chance for this new broom to sweep things clean. Between the two banks they were running computers manufactured by five different suppliers all purchased in the space of a decade. The new man in charge was given the job to rationalise these assets. Replacing the Burroughs' computers with IBM machines, it was argued, was the rational thing to do. By 1974, all of the Burroughs computers been removed from Willesden.[102] The Burroughs Computer Centre was now the Willesden Computer Centre. Barclays confessed to losing £4 million on the project – the original order price of the B8500 – which Ackrill and Hannah, authors of the bank's official

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[99] Ted Schoeters, "Barclays D-Day Computer Plan Suffers Serious Setback", *Financial Times*, 27 February 1970, 23.

[100] Gerry Jarvis, interview with author, Macclesfield, 26 September 2008.

[101] BGA/275/3, Alan Duncan, interview with Jessie Campbell, 11 August 1998.

[102] BGA/754/31, David Bound, interview with Janet Sykes, 19 October 1990; Gerry Jarvis, interview with author, Macclesfield, 26 September 2008.

history, suggest the bank put down to experience.[103] Elsewhere the Midland and Barclays estimated between them that the Burroughs debacle had cost £16m in lost savings.[104]

Publicly Barclays may have reached closure, but privately those working closest to the Burroughs machines couldn't understand the decision to cancel the project. What was left of Barclays' Burroughs programming team, was reluctant to give up on the Burroughs real-time project, and insisted they were on the verge of a working real-time system. Decades later, they still struggled to explain its demise. A number of the team felt let down by senior managers and maintained that given six more months they would have been able to deliver the system the bank deserved. Many of those involved couldn't understand why the project had been shelved now that they had come so far.[105] Looking back and searching for explanations the majority view from those working on the system was that Burroughs' real-time technology was simply "too far ahead of its time".[106]

Barclays' official history concurs and suggests that senior management attributed no blame to anyone inside the bank for the Burroughs affair.[107] Many years on this is still a sensitive issue, but my research suggests that notions of blame at the time weren't entirely absent. Whether it was a matter of causation or correlation, the

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[103] Ackrill and Hannah, *Barclays*, 332–334.

[104] Board Minutes; Roger Vielvoye, "Computer Delay Will Probably Cost the Banks £16m in Lost Savings", *The Times,* 9 August 1971, 16.

[105] BGA/275/3, Alan Duncan, interview with Jessie Campbell, 11 August 1998; David Parsons, interview with author, 7 August 2008; Gerry Jarvis, interview with author, Macclesfield, 26 September 2008; Bob Hall, telephone interview with author, 5 August 2008.

[106] See, for example, Brian Hull, interview with author, Wilmslow, 21 October 2008; BGA/725/3, Alan Duncan, interview with Jessie Campbell, 11 August 1998; Stan Gray, interview with author, Haslington, 22 July 2008.

[107] Ackrill and Hannah, *Barclays*, 332–334.

innovators from the technical team were given research roles or moved to other areas away from the operational frontline.[108]

Conclusion

In *Computer* Campbell-Kelly and Aspray contend that it was inertia from archaic batch-oriented accounting methods that prevented innovations such as real-time accounting in banking taking place.[109] Furthermore, they suggest that the banks had no need for real-time computing until the introduction of ATMs. The pursuit of real-time banking for three of the British banks was influenced by a number of factors, none of which was the contemporaneous introduction of ATMs. Rather, the need was constructed out of a combination of manufacturer marketing, enforced change, and the allure of a technical ideal. It is perhaps because this episode was considered one best forgotten according to Barclays' official history,[110] that the "failure" of real-time computing in banking in the 1960s has been written out of the history of computing.

Graeme Gooday and Kenneth Lipartito both warn historians against preserving binary distinctions between "success" and "failure".[111] "Failure" was certainly not a category used by the actors involved in this case. Archival material in Barclays Group Archives made no mention of project failure, as one might expect, and the closest any of the interviewees came to talking of the project in terms of a failure was referring to another project in the same breath as "another failure". I do not wish to debate notions of the project's success and failure, but conclude by considering whether it is possible to

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[108] Brian Hull, interview with author, Wilmslow, 21 October 2008; Gerry Jarvis, interview with author, 26 September 2008.

[109] Campbell-Kelly and Aspray, *Computer*, 175.

[110] Ackrill and Hannah, *Barclays*, 332-334.

[111] See Graeme Gooday, "Re-writing the 'Book of Blots': Critical Reflections on Histories of 'Technological Failure'", *History and Technology* 14 (1998): 265–291 and Kenneth Lipartito, "Picturephone and the Information Age: The Social Meaning of Failure", *Technology and Culture* 44, no. 1 (2003): 50–81.

the project's unsuccessful outcome as something more than a necessary lesson for those involved at all levels of the project.

Lipartito see both failures and non-failures as "socially resonant" and capable of shaping future options.[112] The explanation given by those in the community of practice working close to the machine was echoed by the wider rhetoric of real-time. At a macro level, the demise of the Barclays-Burroughs real-time project did not weaken the desire for real-time banking technology and the cashless society; it merely modified the parameters required for its success. Commentating on the episode, the British banking journal, *The Banker,* concluded that:

> Until stores, garages and so on each have terminals on-line, real-time to the same computer system as the banks[,] cheques and credits outstanding with them will distort the condition of individual accounts [...] The distortion is all the more evident if other banks are not participating in the system. This said, all the British clearing banks would agree that real-time will be a feature of the financial system sometime in the future, but when planned and implemented on a national scale rather than when introduced piecemeal by individual financial institutions.[113]

The Banker did not call into question the very idea of real-time banking, just how and when it might happen. The end of the Barclays-Burroughs' real-time project signified a change in the technological path leading towards real-time banking and the cashless society. It was not declared a dead end; it just needed someone else to find the way. It was left to the savings banks, devoid of the temporal distortions of cheques and the clearing system, to pioneer real-time computing for British banking in the 1970s.[114]

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[112] Lipartito, "Picturephone and the Information Age", 54–55.

[113] *The Banker* (August 1971).

[114] Hadyn Taylor and Harry Read, interview with author, Milton Keynes, 17 July 2008.

Forty years later, the dream of the cashless society lives on for those who continue to have a vested interest in making this dream a reality.[115]

[115] For example Steve Perry, vice president of Visa Europe, see Philip Aldrick, "Is a Cashless Society on the Cards", *Daily Telegraph*, 11 January 2010.