

In-House Computing? (De-)Centralizing data services in Germany, c. 1970

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1. Computers in the Federal Republic of Germany around 1970

The widely popular electronic brains in the dawning computer age were large machines, usually surrounded by even larger computing centres. Thus, since the 1950s, centralized computing services, based on colossal data processing machines, had gained an overriding importance in business, administration and academia, as acquiring computers was energy-, manpower- and capital-intensive, and know-how was scarce. Smaller companies, therefore, shared computing time and used (mainframe) computers and consultancy services from IBM and other competitors extensively through the 1960s.¹ As in the United States, computer power via data networks developed into a dynamic business area throughout Europe and, thus, also in West Germany, while time-sharing became the order of the day, both in industry as well as in the banking and insurance sectors. However, data service centres were facing new challenges by the 1970s, as decentralized arrangements and consultancy agencies emerged. Since computer usage had become substantially cheaper, a new make-or-buy debate quickly flared up in Germany under the slogan: “EDP in-house or outsourced?”² Small computers and microcomputers with microchips and miniaturized hardware now conquered offices and factories, while computer networks simultaneously expanded, making long-distance data transmission and remote working arrangements possible.³ Hence, in addition to setting up, maintaining and repairing computer systems, service

1 Leimbach: *Geschichte der Softwarebranche*; Gugerli: *Welt*; Dommann/Rickli/Stadler: *Data Centers*; Campbell-Kelly/Garcia-Swartz: *Economic Perspectives*; Hu: *Prehistory*; Yost: *Making IT Work*.

2 Komor: *EDV*; MMA: *EDV-Praxis*, p. 197–137.

3 Neugebauer/Dehn/Thomae: *Untersuchung*; Neugebauer/Marock/Bujara: *Markt für Software*; Bundesministerium für Wirtschaft, BMWI-Dokumentationen: *Informationstechnik*.

companies installed computer networks and communication systems and designed customized programming solutions.

Politicians, entrepreneurs and publicists in West Germany closely observed the developments across the Atlantic, and soon, a larger political debate revolved around the question whether computers and computer-based data services should be centralized or decentralized. Here, state intervention had promoted a new technology policy for electronic data processing (EDP) since 1955. Nationwide EDP-subsidy programmes started in 1967⁴ with an initial focus on industrial research and development and, most importantly, hardware production.⁵ As the West German industrial landscape was characterized by the dominance of small and medium-sized enterprises, which – similar to the country's federalist structure⁶ – shaped the process of digital transformation,⁷ observers quickly predicted a growing need for on-demand access to data processing services via the telecommunications network.⁸ Hence, in Germany, one of the world's top computer markets in the 1960s and early 1970s, and home to renowned hardware companies including Siemens, AEG and, in the mid-range computing sector, Nixdorf, Kienzle and Triumph-Adler⁹, the implementation of nationwide computer services was a priority on the political agenda.

Using the West German case as an analytical lens to portray the complex liaisons between state and industry in 20th century computer policy, this article is devoted to the growing controversy over (de-)centralizing computer systems and computer expertise in the 1970s as a crucial, but largely overlooked milestone on the country's pathway into the digital age. Thus, it centres on the role which data centres, with large data processing machines and peripheral devices, on the one hand, and new decentralized

4 Homberg: Innovation; Bösch: Wege.

5 Sommerlatte et al.: Entwicklung, p. 80; cf. Leimbach: Geschichte der Softwarebranche, p. 182–187.

6 Thieß: Digitalgeschichte.

7 Petzold: Rechnende Maschinen, p. 428–432; Leimbach: Geschichte der Softwarebranche, p. 70.

8 Civilian computer usage served primarily to optimize and rationalize work processes. Accounting and bookkeeping, thus, powered German computer expansion. Digital technologies made a decisive contribution here to the expansion of the service society by radically changing logistics in mail-order businesses from the 1950s onwards, shaping systems for booking air and rail travel in the transportation and tourism sectors, and designing the processes in the banking sector with checking accounts and electronic payments. Cf. Bösch: Wege, p. 13; Heßler: Ersetzung; Müller: Job-Killer.

9 Jansen et al.: Untersuchung, p. 33f.; Diebold: Bedeutung, p. 203f.; Jacob/Jungemann: Statistischer Sammelband, p. 31–88, 181–188.

systems, based on small and mid-range computers, on the other, played in business and administration plans between the late 1960s and the early 1980s. Accordingly, the article exemplarily spots the political and economic power struggles over public-private partnerships when building computer service companies nationally.

2. Scaling Data Services: Governmental Policies and Corporate Interests in Digital Networks and Centralized Hardware Solutions

“Small computers or large data centres?”¹⁰ This very question increasingly moved business leaders and governmental planning authorities in West Germany through the 1960s and 1970s. At first sight, however, there was little reason to question the crucial role of data centres in these days. The 1970s saw a veritable boom in computer (service) centres. Around 1970, there were more than 500 centres in West Germany; among them, 150 to 200 worked exclusively or partially for third parties.¹¹ Further attempts to centralize the EDP activities were mirrored in an EDP co-ordination and advisory office in public administration, set up by the German cabinet in March 1968 to establish a nationwide database network. Only a few weeks later, the *Gesellschaft für Mathematik und Datenverarbeitung* (Society for Mathematics and Data Processing) was inaugurated as a body to discuss and execute system planning and programming attempts,¹² while the *Cooperation Committee on Automated Data Processing* (KoopA ADV), formed

10 Schneider: Kleincomputer oder Rechenzentrum?.

11 The *Verband Deutscher Rechenzentren* gathered various service providers. See on this Lange-Hellwig: Rationalisierung, p. 34–52; VDRZ: Dienstleistungsunternehmen. On the data centre boom in the 1960s and 1970s, see Schneider: Kleincomputer, p. 87–95; Heinrich: Gemeinsame Computernutzung, p. 77–83; Hellfors: Zusammenarbeit, p. 5; Wirtschaftsforum. Rund 560 Rechenzentren in der Bundesrepublik, in: MM-Industrie-Journal, Vol. 78, No. 20 (1972), p. 400; Schwab: Zukunft, p. 132. Fischer/Frimmel: Gemeinschaftliche Datenverarbeitung, p. 9–11; Klotten: EDV-Markt, p. 130–136; Neugebauer/Dehn/Thomae: Untersuchung, p. 89–92. Another study names around 300 service computer centers: Seibt/Oehler: Erhebungen.

12 Deutscher Bundestag: Bericht der Bundesregierung über die Anwendung der elektronischen Datenverarbeitung in der Bundesverwaltung, 7 October 1968, Drucksache V/3355. URL: <https://dserver.bundestag.de/btd/05/033/0503355.pdf> (accessed: 7 September 2023), p. 1–7; cf. Frohman: Network Euphoria, p. 311–313.

on 10 February 1970, centrally organized and co-ordinated the collection of data holdings at the federal, state and local levels.¹³

The Federal Ministry of Posts and Telecommunications (Deutsche Bundespost, DBP), with its monopoly in telecommunications, was a key actor in shaping the digital change in Germany. The DBP was in a key position to regulate the national computer networks and, with that, the upcoming data centre landscape, as the ministry was able to control the tariffs for digital data traffic. However, despite such plans being initially on the table, there were legal reasons which thwarted a directly owned DBP timesharing service. According to the Federal Constitutional Court, the DBP was only granted an unchanged transmission of signals, whereas data processing services had to be delegated to a third party.

The Federal Minister of Posts and Telecommunications, Werner Dollinger, had become acquainted with a timesharing service operated by the local telecommunications administration NTT (Nippon Telegraph and Telephone Public Corporation, Tokyo), during a trip to Japan in the late 1960s. He also read reports on nationwide services in England and Sweden. Bearing in mind the accelerated digital change in the USA, he commissioned to establish a comparable service in Germany. His successor Georg Leber continued to pursue the dirigiste planning calculus from the 1970s onwards.¹⁴

The plan to create new, centralized EDP services was eventually embodied in the *Deutsche DATEL-Gesellschaft für Datenfernverarbeitung* (German DATEL Company for Remote Data Processing). This company had

13 Brinckmann/Kuhlmann: Computerbürokratie, p. 123–133; cf. generally Fleischhack: Welt, p. 38–65. In the process, states and municipalities decided on the legislative basis to synchronize data traffic through “information systems”. As a result, a network of municipal data processing centres, so-called *Gebietsrechenzentren* (KGRZ), was established, which provided regional data services for the public sector. There were more than 100 municipal data centres by 1978. Cf. KGSt, Gutachten; KGSt, Berichte; ADV 1987. The expansion of digital networks depended largely on economic and political goals, but it was also shaped by regional disputes over competencies and local situational opportunities. Cf. Thießen: Digitalgeschichte, p. 64–68.

14 DBP, Datendienste, 24 March 1967; Meeting with AEG-Telefunken and Siemens AG on 15 January 1969 on the promotion of EDP and data transmission by DBP; Memorandum (“Aktenvermerk”), 18 April 1969; Technical Report, T-No. 18, Data Communication System for Nation-Wide Banking Business, Synopsis, 30 April 1969, B 257/20248; Administrative Board, DBP, meeting minutes, 31 July 1970, p. 47–50, B 257/1753; on early press reports since 1968, see DATEL-Report, 28 June 1973, B 106/99520; Press Review, 20 July 1970 – Gründung DATEL, B 257/1753, Bundesarchiv Koblenz (BAK).

been established, in line with preliminary agreements, as a private-law subsidiary to the DBP on 1 June 1970. In addition to the DBP as the main shareholder (with 40 % of the company's shares), the consortium included the leading national computer manufacturers Siemens, Nixdorf and AEG-Telefunken along with Olympia (with 20 % each). As the existing computer service centres in Germany were mainly held by IBM and other US competitors, this endeavour aimed to strengthen the domestic computer companies in line with larger industrial subsidy policies. Suggestions to include US companies, such as IBM, UNIVAC and CDC, were, thus, quickly overruled. Overall, the DATEL should, hence, do nothing less than "supporting the national computer industry".¹⁵ Facing the "American challenge",¹⁶ the German national "champions" were gathered to bridge the "technological gap".¹⁷

DATEL immediately spurred a huge media attention – and incited mixed feelings – by marketing new plugged-in computer networks ("*Computer aus der Steckdose*"). During its early conceptual days, in the late 1960s, Dollinger had only contacted leading Siemens and AEG executives, echoing close political relationships with certain computer hardware suppliers. Thus, competitors – especially among mid-range computer companies – harshly criticized the approach, as they worried that such plans could end up in a state monopoly in computer services and privilege competitors one-sidedly. Due to ongoing protests, and along with suggestions in ministerial bureaucracy, the consortium was extended with Olympia and the Nixdorf Computer AG as shareholders.¹⁸ The *Manager Magazin* in 1972/73

15 Note on the situation DBP/DATEL GmbH, 8 January 1970; Willy H. Schlieker to Minister Georg Leber, 23 March 1970, B 257/20248; Deutsche Bundespost gründet Deutsche DATEL GmbH, outline of the announcement, B 257/20248, BAK. The DBP, here, was said to "catalyze" EDP knowledge and experience within the consortium. On the political agenda, see explicitly: Meeting AEG-Telefunken/Siemens AG, 15 January 1969, B 257/20248, BAK.

16 Servan-Schreiber: Die amerikanische Herausforderung.

17 Homberg: Innovation. On IBM's dominance in West Germany, see Stoltenberg: Die amerikanische Herausforderung; Ibid: Bundesrepublik, p. 258. The plans to establish a European computer company – through a consortium led by Siemens, Philips and the French Compagnie Industrielle pour l'Informatique – as a "fortress" against the dominating US competitors were pursued in the same vein. On these plans, see Unidata (I), 1971–1973, File No. 21945; Unidata (II), 1972–1973, File No. 22839; Unidata MC, 1973–1977, File No. 22752; Siemens Corporate Archives, Munich/Berlin. See also generally Kranakis: Politics; Hilger: European Enterprise; Ahrens: Varieties of Subsidization?.

18 Scherer: Telekommunikationsrecht, p. 368–372.

now saw prosperous perspectives in centralizing digital expertise in Germany, despite the monopoly issues, and explicitly attacked disparate work processes and “inefficient” single-solutions shaping the country’s economic culture.¹⁹ As DATEL quickly incorporated several small companies, others, however, disapproved the company’s “ever-growing” appetite, calling DATEL a “haphazardly purchased dump”.²⁰

DATEL had been established to expand “telecommunications routes” and build up a national computer centre network based on remote “time-sharing” capabilities.²¹ Its declared goal was to make commercial IT applications and services, in cooperation with the German Computer Centre (Deutsches Rechenzentrum), affordable, particularly for small and medium-sized enterprises. Data transmission capacities were in high demand and – with DATEL – computers and terminals were connected to the various data networks in growing numbers, while remote data processing was envisioned to bridge the performance gap between mid-range and large-scale, mainframe computer technology.²² Advertising centralized computer services, however, required more than digital networks only – and so DATEL’s products and services expanded. In addition to leasing, maintaining and repairing hardware, such as computer terminals, the company

19 Computer aus der Steckdose. Monopol für Datel? in: *Manager Magazin*, Vol. 2, No. 6 (1972), pp. 70f.; Selbst programmieren kommt teuer zu stehen, in: *Manager Magazin*, Vol. 3, No. 8 (1973), p. 62–66, here p. 62. See also Deutsche Datel-Gesellschaft für Datenverarbeitung endgültig gegründet – Nixdorf und Olympia dateln mit, in: *Bürotechnik + Automation*, No. 8/1970, p. 508f.

20 Die DATEL-Gefahr bleibt: Sie wächst und wächst, in: *Die Computer Zeitung*, 17 April 1973, p. 6.

21 Datenverarbeitung. Computer von der Post, in: *Die ZEIT*, 22 May 1970, p. 30; cf. Kein Gegensatz zum eigenen Rechner. *Industriemagazin-Gespräch mit Dr. Bernhard Friedmann*, in: *Industriemagazin*, 2 June 1972, p. 38; Novotny, Mähner und Assoziierte: Service Rechenzentrum der Deutschen DATEL, in: *DLW-Nachrichten* (1973), pp. 42f.; 100 Millionen Mark Verwirtschaftet. Das Debakel der Datel, in: *Frankfurter Allgemeine Zeitung*, 8 January 1975, p. 7; Röhr: Der lange Weg, p. 193–196.

22 The demand in data transmission capacities in Germany was highly distributed among the various networks. Companies were particularly keen on using data transmission via the telephone network and fixed lines, so-called “power lines” (*Stromwege*), while demand for data transmission via the Telex or Datex network remained low. The DBP had listed an increase in computers and terminals connected to its networks since the late 1960s, from 1,273 to 17,553 in 1973 and roughly 37,350 in 1975. Other services, such as the electronic data exchange system (EDS) by Siemens, remained in an experimental phase, while an Integrated Services Digital Network (ISDN) was only planned in the late 1970s and early 1980s. Cf. Röhr: Weg, p. 197–200; see also Tietz: Dateldienste.

launched consultancy services, coached clients in EDP usage, and eventually even commercialized standardized programmes and applications.²³

The company grew quickly regarding its personnel and service branches. DATEL started with three employees in June 1970; by December, there were already more than thirty. A year later, over 300 people were working at the headquarters and its branches. In October 1972, the company then reached nearly 500 employees, and even surpassed this with approximately 550 in June 1973. By December 1973, DATEL ran ten data centres across the country, from Berlin to Essen and from Hamburg to Munich.²⁴

All parties involved had high expectations: While the DBP aimed to develop a nationwide data network, the computer companies in the consortium hoped to scale products and services. This plan seemed to materialize for Siemens and AEG, as nearly all DATEL data (service) centres quickly acquired large main computers – mostly made in Germany (seven were made by Siemens, one by AEG and only one by UNIVAC). Furthermore, data devices, terminals and peripherals were anticipated to be sold to DATEL clients by the mid-range computing companies in the consortium. However, despite the fact that DATEL's representatives regularly participated in working groups on mid-range computing and EDP outsourcing (*Arbeitskreis MDT und Datenverarbeitung außer Haus*), for example, in the *Arbeitsgemeinschaft für Wirtschaftliche Verwaltung*, the consortium quickly deprioritized its small-scale customer services in order to pursue large-scale data network plans. As a result, after 12 months, Nixdorf's shareholders internally already reconsidered the company's participation in DATEL, particularly as leading executives neither expected a "return-on-investment" nor groundbreaking "innovations in the EDP sector" by the new service consortium. To make matters worse, the press quickly reported

23 On DATEL's goals, see *Ziele und Aufgaben der Deutschen DATEL GmbH*, 21 September 1969, B 257/1753; Bernhard Friedmann: *Die deutsche DATEL Gesellschaft*, Skizze, c. 1973; Brochure: *Die Datel GmbH als EDV-Dienstleistungsunternehmen*, c. 1973; DATEL-Report, 28 June 1973, B 106/99520; *Chefbriefe/Mitteilungen der Geschäftsleitung*, in: DATEL-Intern, No. 1, 25 October 1972, p. 3f., B 257/7166, BAK.

24 *Die Datel GmbH als EDV-Dienstleistungsunternehmen*, c. 1973; *Ein wichtiger Tag*, in: DATEL Report, 28 June 1973, p. 1, B 106/99520; *Jahresbericht 1971*, B 257/7165; *Jahresbericht 1972*; *Entwicklung eines Rechnerverbundsystems durch die DATEL GmbH*, B257/7166, BAK. On DATEL's growth, see *Die DATEL-Gefahr bleibt: Sie wächst und wächst*, in: *Die Computer Zeitung*, 17 April 1973, p. 6. The DATEL headquarters has been located in a newly erected skyscraper in Darmstadt, Neu Kranichstein, since May 1973.

sensitive discords among the shareholders. Nixdorf announced in November 1973 that it was leaving the consortium.²⁵

The DATEL dream, thus, proved short-lived, as repeated disagreements over organizational, technological and strategic issues caused the alliance to break up within a few years. When Siemens and AEG finally announced their withdrawal and DATEL was sold to foreign competitors (Générale de Service Informatique Europe, GSI, Brussels, and INDELEC, Schweizerische Gesellschaft für elektrische Industrie, Basel), the German Bundestag lamented in March 1975 over a potential foreign network monopoly.²⁶ The episode exemplarily revealed how regional and national subsidy policies as well as new, fragile economic alliances determined the expansion of digital networks, data centres and computer services in Germany.

3. Centralize or Decentralize Computing? The 1970s as a Digital Transition Period

In Germany, during the 1970s, large corporations with data centres and cross-sectional EDP departments experimented with new, decentralized ways to enter, process and store data, based on microelectronics, mid-range computers and, subsequently, microcomputers and personal computers.²⁷

25 Wir und unsere Aufgaben, in: DATEL-Intern, No. 1, 25 October 1972, p. 7; Neues vom MDT+DVaH-Arbeitskreis des AWV, in: DATEL-Intern, No. 2, 6 November 1972, p. 4, B 257/7166; Supervisory Board Minutes, Meeting 21 June 1974, DATEL Hochhaus, p. 5f., B 257/7167; DATEL im Markt von morgen, in: DATEL-Report, 28 June 1973, n.p., B 106/99520, BAK. See also Deutsche Datel-Gesellschaft für Datenverarbeitung endgültig gegründet – Nixdorf und Olympia dateln mit, in: Bürotechnik + Automation, No. 8/1970, p. 508f.; Angst vor IBM und Mut zum neuen System. Interview mit Heinz Nixdorf, in: Computerwoche, 13 November 1974, p. 8; Steigt Nixdorf bei Datel aus?, in: Frankfurter Allgemeine Zeitung, 26 October 1974, p. 14; Die Datel kommt die Bundespost teuer zu stehen, in: Frankfurter Allgemeine Zeitung, 17 December 1974, p. 11; 100 Millionen Mark Verwirschaftet. Das Debakel der Datel, in: Frankfurter Allgemeine Zeitung, 8 January 1975, p. 7.

26 Deutscher Bundestag, Stenographische Berichte, 7. Wahlperiode, 155. Sitzung, 13 March 1975, p. 10857. On DATEL history, see generally B 257/7164 – B 257/7168; B 257/20248 – B 257/20253, BAK. For a historical perspective on the German Computing Centre, see also: Deutsches Rechenzentrum (DRZ), N 24, Hessisches Staatsarchiv Darmstadt; DRZ, fonds 504, No. 6655 – No. 6667; fonds 507, No. 7641, Hessisches Hauptstaatsarchiv, Wiesbaden.

27 When the golden age of “mainframes” ended, mid-range computers in the 1970s and the rise of personal computers in the 1980s and 1990s opened up new user groups. On mid-range computing, see Heinz Sebing: Mittlere Datentechnik – kein

Concurrently, computer centres operating on vendor-bound hardware services were shared by small and medium-sized enterprises – and sometimes, as in the case of the Volksbanken or DATEV, even in cooperative models.²⁸ Above all, however, small business computers provided new opportunities, especially for self-employed professionals and small and medium-sized enterprises. Lawyers, physicians or tax consultants discovered computers in these days as crucial tools to optimize and rationalize their daily administrative duties.²⁹ Computers were gradually adopted even in crafts businesses.³⁰ The usage, according to Lutz J. Heinrich, was widely spread.³¹

From this perspective, the 1970s can be seen as a digital transition period. To pin down the change in numbers: according to a contemporary survey, hardly any company with less than 50 employees in the late 1960s used (or planned to use) data centres in order to pursue publicly debated EDP outsourcing plans. For many businesses, it was simply too expensive to use digital computers, even via time-sharing. Here, conventional punched card and accounting machines remained unrivalled, especially as modern on-line data processing (as a means to centralize remote resources) was barely

Gegensatz zur Buchführung außer Haus, in: *Der Erfolg*, No. 3 (1976), p. 12–16, Sonderdruck, DATEV Corporate Archives; Pleil: Büro- und Personalcomputer; cf. generally Müller: *Mittlere Datentechnik*; Müller: *Kienzle*. On personal computers, see Danyel: *Zeitgeschichte*; Ehrmantraut: *Computer*; Sarasin: 1977.

- 28 Nähr: *Schramberger Modell*; Heinrich: *Gemeinsame Computernutzung*, p. 87–103; Thürbach: *Automatisierte Datenverarbeitung*, p. 370–413; Straube: *Zwischenbetriebliche Kooperation*, p. 151–157; DATEV: *Die DATEV heute*, Broschüre 1973, DATEV Corporate Archives; Dube: *Computer*. On private and state computer schools see, e.g., *Berufe / Datenverarbeitung: Aufstieg zu Cobol*, in: *Der Spiegel*, 8 February 1970, p. 78f. The DGB's Bundes-Fachschule was among the largest computer schools around 1970. Individual computer service bureaus also offered their services, such as the cooperatively organized DATEV Kolleg. DATEV (1970): *Werbeschreiben Steuerberater*, p. 1f., DATEV Corporate Archives.
- 29 Reichertz: *Bedeutung*; Wolff: *Einsatz*, p. 21–36, 139–160; Kilian: *Juristische Entscheidung*; Ulf Bauernfeind: *Eigener Computer oder Datenverarbeitung außer Haus*, in: *Der Steuerberater*, 20 December 1977, p. 285–290; Niebling/Kussel/Freis: *Computer*.
- 30 Bensberg: *Elektronische Datenverarbeitung*; Rogowski/Kohle: *Datenverarbeitung*; Nagel/Single: *Handwerk*, p. 51–57.
- 31 Heinrich: *Mittlere Datentechnik*, p. 240. In a commentary published in the German trade press magazine *Computerwoche*, Heinrich challenged the conventional semantics of “mid-range computing” as a complicated, technical term and emphatically proclaimed a new nomenclature: “user-oriented computer systems”. As new competitors arose who marketed “workstations” and “distributed data processing”, companies should be alerted to win new users. Cf. *Abschied von der Mittleren Datentechnik*, in: *Computerwoche*, 10 February 1978, p. 6.

on the horizon. This changed only slowly in the 1970s, when an accelerated trend to “decentralize” data processing via mid-range and minicomputers grew popular and “full-service EDP service companies” gained ground.³² Thus, mid-range computers were used by small and medium-sized enterprises, and, increasingly, within large-scale corporations. According to Nixdorf, nearly 50 % of the company’s business revenue in the early 1970s was generated by sales in this category. The consultancy and marketing research company *Diebold Deutschland* even stated in 1975 that there was a continuous trend towards the coexistence of “large and small computers”, as every second mid-range computer was sold to large size companies.³³ Here, they were utilized as office terminals and components in the data centre architecture.

A representative sample survey among nearly 4,250 companies in West Germany, commissioned by the Federal Ministry of Research and Technology in 1980, analysed German EDP markets and customer structures in-depth. Only 22 % of the companies (with more than ten employees) used their own computer systems, another 40 % were indirectly supplied by company headquarters or commercial data centres.³⁴ A total of 27 % of all data centre clients were larger corporations with more than 500 employees, while roughly 50 % were registered as mid-sized companies (50 to 500 employees) and another 20 % as small companies. The users were mainly regionally active, private service, sector companies, closely located (< 50 kms) to the data centres.³⁵ This mixed picture remained paradigmatic in the 1970s and early 1980s. However, since the mid-1980s and especially during the 1990s, new, cheaper and smaller solutions slowly

32 Heinrich: *Gemeinsame Computernutzung*, p. 196–213; Diebold: *Markt*, p. 30, 45–50, 73–81; Heinrich et al.: *Mittlere Datentechnik und Datenverarbeitung*, p. 1–11, 64–67; Service-RZ – oder lieber etwas Eigenes?, in: *Computerwoche*, 27 June 1975, p. 5; Stahlknecht: *Erfahrungen*, p. 84–87; Rösner: *Wettbewerbsverhältnisse*, p. 32–37; cf. also generally Leimbach: *Geschichte der Softwarebranche*, p. 238–245.

33 Rösner: *Wettbewerbsverhältnisse*, p. 35f.

34 As hardware acquisition depended greatly on the company’s size, small businesses (increasingly even companies with under 10 employees on which the study only provided estimates) especially used computer service bureaus. Around 60 % of private owners used a small EDP system (purchase price less than 100,000 DM), and only 3 % could afford a large system whose costs exceeded one million DM.

35 Neugebauer/Marock/Bujara: *Markt*, p. 12, 40–48, 54–58, 62–65, 80–82.

dampened all data centre euphoria³⁶ and equally caused a rapid decline in mid-range computing, as workstations and personal computers conquered the markets.

4. Conclusion

Revisiting structural developments in West Germany's computer industry in the 1970s, this article explored governmental plans and path decisions to centralize or decentralize computers in industry, commerce and administration – with a special emphasis on a passionate make-or-buy debate quickly popularized under the slogan “EDP in-house or outsourced?”. The threshold to the 1970s proved to be a decisive period, as dirigiste attempts to build up “national champions” in the computer industry and services, driven by an ongoing planning euphoria, were undermined by an accelerating worldwide competition in information and communication technologies. The DATEL story, hence, exemplarily showed how and why the country's regional and national subsidy calculus promoting new, however, non-durable economic alliances shaped expanding digital networks, devices and services. Technologically, small computers increasingly challenged the idea to centralize computers in large data centres and computer expertise in cross-sectional EDP departments. Hence, as microelectronics developed, decentralized (corporate) consultancy services saw a new boom driven by the “unbundling” of hardware and programming services. In a larger perspective, national solutions and claims, however, were globally entangled. Thus, since the 1980s and 1990s, when digital experts and consultants were mobilized by an enhanced drive to outsource work processes all around the globe, a new move to centralize data work and data services in large computing hubs, server clusters and business process outsourcing centres was under way, as digital networks expanded and cloud solutions grew popular. Hence, analysing the attempts and approaches to (de-)centralize digital work processes, with all their material and know-how resources, through a global lens remains a promising endeavour to explore the digital age, its systems, actors and dynamics in knowledge exchange.

36 Röske: Umstellung; Neugebauer/Marock/Bujara: Markt, p. 57; Gerhard Karck: Der Zahn der Zeit nagt auch am RZ, in: Online, Vol. 23, No. 8 (1985), p. 76; Leimbach: Geschichte der Softwarebranche, p. 260–262; 382.

5. Bibliography

- ADV (eds.): *Erfahrungsaustausch ADV Bund/Länder/Kommunaler Bereich am 5./6. März 1987 in Hamburg*, Hamburg/Berlin 1987.
- Ahrens, Ralf: "Varieties of Subsidization? Die staatliche Förderung der Computereindustrie in der Bundesrepublik und Großbritannien von den 1960er bis 1980er Jahren", in: Köhler, Ingo / Roelevink, Eva-Maria (eds.): *Transformative Moderne: Struktur, Prozess und Handeln in der Wirtschaft*, Münster 2021, p. 495–512.
- Bensberg, Hermann: "Elektronische Datenverarbeitung im Handwerk", in: AWV (ed.): *Datenverarbeitung heute und morgen. Drei Expertenbeiträge*, Frankfurt a.M. 1970, p. 41–50.
- Bösch, Frank (ed.): *Wege in die digitale Gesellschaft. Computernutzung in der Bundesrepublik 1955–1990*, Göttingen 2018.
- Brinckmann, Hans / Kuhlmann, Stefan: *Computerbürokratie. Ergebnisse von 30 Jahren öffentlicher Verwaltung mit Informationstechnik*, Wiesbaden 1990.
- Bundesministerium für Wirtschaft, BMWI-Dokumentationen (ed.): *Informationstechnik in Deutschland. Bericht über die Situation der informationstechnischen Branche und den Einsatz in der Informationstechnik in der Bundesrepublik Deutschland*, Bonn 1990.
- Campbell-Kelly, Martin / Garcia-Swartz, Daniel D.: "Economic Perspectives on the History of the Computer Time-Sharing Industry, 1965–1985", in: *IEEE Annals of the History of Computing* 3 (2008), p. 16–36.
- Danyel, Jürgen: "Zeitgeschichte der Informationsgesellschaft", in: *Zeithistorische Forschungen/Studies in Contemporary History* 9/2 (2012), p. 186–211.
- Diebold Deutschland GmbH: "Bedeutung und Entwicklung der automatischen Datenverarbeitung", in: Friedrichs, Günter (ed.): *Computer und Angestellte*, Vol. 1, Frankfurt a.M. 1971, p. 197–246.
- Diebold Deutschland GmbH: *Der Markt für Datenerfassungsgeräte, Terminals und Kleincomputersysteme in der Bundesrepublik Deutschland, Teil III: Kleincomputersysteme*, Frankfurt a.M. 1972.
- Dommann, Monika / Rickli, Hannes / Stadler, Max (eds.): *Data Centers. Edges of a Wired Nation*, Zürich 2020.
- Dube, Jürgen: *Computer für Genossenschaften. Die Geschichte der genossenschaftlichen Rechenzentralen*, Wiesbaden 1993.
- Ehrmantraut, Sophie: *Wie Computer heimisch wurden. Zur Diskursgeschichte des Personal Computers*, Bielefeld 2019.
- Fischer, Hellmuth / Frimmel, Robert: *Gemeinschaftliche Datenverarbeitung – wirtschaftliche Datenverarbeitung*, AWW-Schrift, Stuttgart/Wiesbaden 1976.
- Fleischhack, Julia: *Eine Welt im Datenrausch. Computer und Datenmengen als gesellschaftliche Herausforderung (1965–1975)*, Zürich 2016.
- Frohman, Larry: "Network Euphoria, Super-Information Systems and the West German Plan for a National Database System", in: *German History* 3/2 (2020), p. 311–337.

- Gugerli, David: *Wie die Welt in den Computer kam. Zur Entstehung digitaler Wirklichkeit*, Frankfurt a.M. 2018.
- Heinrich, Lutz J.: *Gemeinsame Computernutzung in der Industrie. Datenverarbeitung außer Haus*, Wiesbaden 1969.
- Heinrich, Lutz J.: *Mittlere Datentechnik – Hardware, Software und Anwendung tastaturorientierter Computer*, 3rd Edition, Köln 1972.
- Heinrich, Lutz J. et al.: *Mittlere Datentechnik und Datenverarbeitung außer Haus. Entscheidungsmodelle zur Verfahrenswahl*, Frankfurt a.M. 1973.
- Hellfors, Sven: *Zusammenarbeit mit Service-Rechenzentren*, Freiburg 1971.
- Heßler, Martina: “Die Ersetzung des Menschen? Die Debatte um das Mensch-Maschinen-Verhältnis im Automatisierungsdiskurs”, in: *Zeitschrift für Technikgeschichte* 8/2 (2015), p. 109–136.
- Hilger, Susanne: “The European Enterprise as a ‘Fortress’. The Rise and Fall of Unidata Between Common European Market and International Competition in the Early 1970s”, in: Schröter, Harm G. (ed.): *The European Enterprise. Historical Investigation Into a Future Species*, Berlin 2008, p. 141–154.
- Homberg, Michael: “Who is leading Innovation? German Computer Policies, the ‘American Challenge’ and the Technological Race of the 1960s and 1970s”, in: *Media in Action* 1/1 (2017), p. 93–114.
- Hu, Tung-Hui: *A Prehistory of the Cloud*, Cambridge, MA 2015.
- Jacob, Uwe / Jungemann, Hubertus: *Statistischer Sammelband erstellt im Rahmen des Forschungsauftrags “Studie über den Nutzen der Förderung der Datenverarbeitung”*, Eggenstein-Leopoldshafen 1972.
- Jansen, Peter et al.: *Untersuchung des Einsatzes von Elektronischen Datenverarbeitungsanlagen in Deutschland. Stand und Entwicklungstendenzen*, Karlsruhe 1969.
- KGSt, Berichte = Kommunale Gemeinschaftsstelle für Verwaltungsvereinfachung (ed.): *Kommunale Datenverarbeitungszentrale im Vergleich – Ergebnisse einer Umfrage 1980*, Köln 1981.
- KGSt, Gutachten = Kommunale Gemeinschaftsstelle für Verwaltungsvereinfachung (ed.): *Organisation kommunaler Datenverarbeitungszentren*, Köln 1975.
- Kilian, Wolfgang: *Juristische Entscheidung und elektronische Datenverarbeitung*, Frankfurt a.M. 1974.
- Kloten, Norbert et al.: *Der EDV-Markt in der Bundesrepublik Deutschland*, Tübingen 1976.
- Komor, Harry: *EDV in Eigenregie oder außer Haus?*, Heidelberg 1970.
- Kranakis, Eda: “Politics, Business, and European Information Technology Policy. From the Treaty of Rome to Unidata, 1958–1975”, in: Coopey, Richard (ed.): *Information Technology Policy. An International History*, Oxford 2004, p. 209–246.
- Lange-Hellwig, Peter: *Rationalisierung durch Datenverarbeitung außer Haus*, Ludwigshafen am Rhein 1972.
- Leimbach, Timo: *Die Geschichte der Softwarebranche in Deutschland*, München 2010.

- MMA = Münchener Messe- und Ausstellungsgesellschaft mbh (eds.): *EDV-Praxis. "Die Anwender sind mündig geworden". Systems-Datenverarbeitungs-Kompendium, Auszüge des Seminars "Datenverarbeitung außer Haus" [Sektion]*, Herne, p. 107–137.
- Müller, Armin: "Mittlere Datentechnik – made in Germany. Der Niedergang der Kienzle Apparate GmbH Villingen als großer deutscher Computerhersteller", in: Reitmayer, Morten / Rosenberger, Ruth (eds.): *Unternehmen am Ende des "goldenen Zeitalters". Die 1970er Jahre in unternehmens- und wirtschaftshistorischer Perspektive*, Essen 2008, p. 91–110.
- Müller, Armin: "Kienzle versus Nixdorf. Kooperation und Konkurrenz zweier großer deutscher Computerhersteller", in: *Westfälische Zeitschrift* 162 (2012), p. 305–327.
- Müller, Moritz: "Von Job-Killern, Roboterkollegen und feuchten Augen. Die Mikroelektronik und die IG Metall als emotional community", in: Heßler, Martina (ed.): *Technikemotionen*, Paderborn 2020, p. 108–127.
- Nagel, Alfred / Single, Erwin: *Handwerk und Computer. Probleme und Gestaltungsmöglichkeiten im betrieblichen Innovationsprozess*, Opladen 1992.
- Nähr, Robert: *Das Schramberger Modell. Gemeinschaftliche Datenverarbeitung außer Haus. Probleme und Lösungen*, Stuttgart 1967.
- Neugebauer, Ursula / Dehn, Detlev: *Stand und Entwicklung des Marktes für mehrfachverwendbare Anwendungssoftware in der gewerblichen Wirtschaft*, Karlsruhe 1976.
- Neugebauer, Ursula / Dehn, Detlev / Thomae, Matthias: *Untersuchung über Maßnahmen zur Verbesserung der Software-Produktion, Teil 5: Der Markt für Anwendungssoftware in der Bundesrepublik Deutschland*, München/Wien 1980.
- Neugebauer, Ursula / Marock, Jürgen / Bujara, Gerd: *Der Markt für Software, Systeme und DV-bezogene Dienstleistungen in der Bundesrepublik Deutschland*, St. Augustin 1983.
- Niebling, Laura / Kussel, Tobias / Freis, David: "Computer und Medizin. Mediale Spannungsverhältnisse im deutschen Gesundheitswesen seit den 1960ern", in: *Curare. Zeitschrift für Medizinethnologie* 45/1 (2022), p. 11–27.
- Petzold, Hartmut: *Rechnende Maschinen. Geschichte der Herstellung und Anwendung rechnender Maschinen und Geräte im Deutschen Reich und der Bundesrepublik Deutschland bis 1968*, Düsseldorf 1985.
- Pleil, Gerhard J.: *Büro- und Personalcomputer in Klein- und Mittelbetrieben*, Stuttgart 1982.
- Reichert, Peter L.: "Die Bedeutung des Computers für die ärztliche Praxis heute und morgen", in: *Deutsches Ärzteblatt* 67/38 (1970), p. 2923–2928.
- Rogowski, Michael / Kohle, Thomas: *Datenverarbeitung außer Haus für Klein- und Mittelbetriebe*, Stuttgart 1971.
- Röhr, Matthias: *Der lange Weg zum Internet. Computer als Kommunikationsmedien zwischen Gegenkultur und Industriepolitik in den 1970er/1980er Jahren*, Bielefeld 2021.

- Röske, Volker: “Umstellung auf dezentrale Datenverarbeitung – das Ende der Rechenzentren?“, in: Reinermann, Heinrich et al. (eds.): *Organisation informationstechnik-gestützter öffentlicher Verwaltungen. Fachtagung der GI*, Speyer, 22–24 October 1980, Berlin, p. 446–450.
- Rösner, Andreas: *Die Wettbewerbsverhältnisse auf dem Markt für elektronische Datenverarbeitungsanlagen in der Bundesrepublik Deutschland*, Berlin 1978.
- Sarasin, Philipp: *1977. Eine kurze Geschichte der Gegenwart*, Berlin 2021.
- Scherer, Joachim: *Telekommunikationsrecht und Telekommunikationspolitik*, Baden-Baden 1985.
- Schneider, Carl: *Kleincomputer oder Rechenzentrum?*, Wiesbaden 1968.
- Schwab, Hans-Jürgen: “Die Zukunft des Angebots an Rechenzentrumsdienstleistungen – die heutige Marktsituation“, in: Münchener Messe- und Ausstellungsgesellschaft mbh (eds.): *EDV-Praxis. “Die Anwender sind mündig geworden”. Systems-Datenverarbeitungs-Kompodium*, Herne 1972, p. 132.
- Seibt, Dietrich / Oehler, Angelika: *Erhebungen zur strategischen Planung der Dienstleistungen von Service-Rechenzentren*, Vol. 1: Oehler, Angelika (ed.): Auswertung der Interviews, Köln; Vol. 2: Seibt, Dietrich (ed.): Auswertung der postversandten Fragebögen, Köln 1980.
- Servan-Schreiber, Jean-Jacques: *Die amerikanische Herausforderung*, Hamburg 1968.
- Sommerlatte, Tom et al.: *Die Entwicklung der Datenverarbeitung in der Bundesrepublik Deutschland. Programmbewertung der DV-Förderung des BMFT 1967–1979*, Eggenstein-Leopoldshafen 1982.
- Stahlknecht, Peter: “Erfahrungen mit der Abrechnung von Rechenzentrums-Dienstleistungen in einem Mischkonzern“, in: Mertens, Peter et al. (eds.): *Abrechnung von Rechenzentrums-Dienstleistungen*, München 1978, p. 83–101.
- Stoltenberg, Gerhard: “Die amerikanische Herausforderung“, in: idem (ed.): *Hochschule, Wissenschaft, Politik*, Berlin 1968, p. 150–156.
- Stoltenberg, Gerhard: “Benötigt die Bundesrepublik Deutschland eine eigene Entwicklung von Datenverarbeitungsanlagen?“, in: Friedrichs, Günter (ed.): *Computer und Angestellte*, Vol. 1, Frankfurt a.M. 1971, p. 247–264.
- Straube, Manfred: *Zwischenbetriebliche Kooperation*, Wiesbaden 1972.
- Thießen, Malte: “Digitalgeschichte als Gesellschaftsgeschichte. Perspektiven einer Regionalgeschichte der digitalen Transformation“, in: Wichum, Ricky / Zetti, Daniela (eds.): *Zur Geschichte des digitalen Zeitalters*, Wiesbaden 2022, p. 53–75.
- Thürbach, Ralf-Peter: “Automatisierte Datenverarbeitung für Klein- und Mittelbetriebe“, in: Grochla, Erwin (ed.): *Das Büro als Zentrum der Informationsverarbeitung*, Wiesbaden 1971, p. 370–413.
- Tietz, Walter: “Datendienste der Deutschen Bundespost“, in: Münchener Messe- und Ausstellungsgesellschaft mbh (eds.): *EDV-Praxis. “Die Anwender sind mündig geworden”. Systems-Datenverarbeitungs-Kompodium*, Herne 1972, p. 39.
- VDRZ: *Dienstleistungsunternehmen der Informationsverarbeitung. Handbuch deutscher Rechenzentren, Service-Rechenzentren, Softwarehäuser u. EDV-Berater, Datenerfassungsbetriebe, OCR- u. COM-Dienste*, Hannover 1980.

Wolff, Max: *Der Einsatz und die Einsatzmöglichkeiten der elektronischen Datenverarbeitung innerhalb der freiberuflichen Tätigkeit von Medizinerinnen, Architekten und Juristen*, Nürnberg 1971.

Yost, Jeffrey R.: *Making IT Work. A History of the Computer Services Industry*, Cambridge, MA 2017.

Annex

All-Purpose Computers (Universal Computers, w/o Medium Data Computers) in the Federal Republic of Germany (valued stock, reporting date: 1 January), Market Shares in %											
Company	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
AEG-Telefunken	-	-	0.8	1.0	1.5	1.7	1.9	1.9	1.8	1.9	2.1
Bull (Bull/GE)	-	1.3	2.3	1.9	1.8	2.3	3.8	5.4	5.5	5.4	4.9
Burroughs	-	-	-	-	0.2	0.3	0.6	0.6	0.6	0.5	0.4
CDC	-	-	0.1	0.2	0.6	0.6	1.0	1.8	1.7	2.0	1.7
Honeywell	-	-	-	-	-	0.1	0.6	1.6	2.0	2.1	2.0
IBM	60.1	65.2	69.0	71.5	71.9	73.0	70.5	66.4	66.6	65.8	65.8
NCR	0.5	0.3	1.5	1.3	1.3	1.2	1.1	1.4	1.4	1.2	1.2
Philips	5.1	3.6	2.6	2.3	1.9	1.4	1.1	1.1	0.8	0.7	0.5
Siemens (since 1968: Siemens-Zuse)	11.5	12.2	9.1	7.4	5.9	5.0	5.5	6.0	8.1	12.2	13.4
Univac	15.0	10.6	8.7	8.3	9.8	9.3	8.9	8.9	7.6	7.0	7.2
Zuse	3.8	3.3	2.7	2.7	2.5	2.6	3.1	2.9	2.3	-	-
Others	4.0	3.4	3.2	3.4	2.6	2.5	1.9	2.0	1.6	1.2	0.8

Annex 1: German Computer Markets (I) | Rösner 1978, p. 60ff., based on Diebold Computer Register.

Company	All-Purpose Computers (w/o Mid-range Computers) in the FRG (valued stock, reporting date: 1 January 1975), Producer Shares in %	Company	Installation, Producer Shares, Mid-range Computers in the FRG (absolute numbers %)
IBM	61.6	Nixdorf	14,000 (25.1)
Siemens/Unidata	17.6	Kienzle	8,600 (15.4)
Honeywell	7.0	Philips	7,300 (13.1)
Univac	5.3	Triumph-Adler	6,800 (12.2)
Burroughs	1.1	Ruf	4,500 (8.1)
ICL	1.1	Akkord	2,400 (4.3)
NCR	1.0	NCR	2,200 (3.9)
Others	5.3	Olivetti	1,900 (3.4)
		Singer	1,700 (3.1)
		Hohner	1,200 (2.2)
		Burroughs	800 (1.4)
		Others	4,350 (7.8)
		Total	55,750 (100)

Annex 2: German Computer Markets (II) | Rösner 1978, p. 62 and p.64, based on Diebold Germany Statistics (o/b/o Federal Ministry of Research and Technology – DP-Program) and own calculations.

Structural Data	Large Mainframe Computer Systems [Großdatenanlagen]	Mid-range Computer Users [MDT-Anwender]	Data Center Users [RZ-Benutzer]	Share, Workplaces [Anteil an Arbeitsstätten insges.]
<i>Basis</i>	487	469	185	
Employees				
<i>under 100</i>	6%	27%	32%	51%
<i>100 up to 200</i>	7%	24%	24%	26%
<i>200 up to 500</i>	22%	34%	26%	15%
<i>500 up to 1.000</i>	22%	8%	13%	5%
<i>1.000 and more</i>	43%	8%	5%	3%

Annex 3: Sample Survey: EDP-Users in the Federal Republic of Germany (FRG) (c. 1975) | Neugebauer et al. 1976, p. 43.

