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2017

https://doi.org/10.25969/mediarep/16238

Veröffentlichungsversion / published version

Zeitschriftenartikel / journal article

https://doi.org/10.25819/ubsi/8069

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1. Introduction

"Where are our billions, Mr Matthöfer?" (Maurer 1977: 7),[1] asked the magazine *Computerwoche* on 20th May 1977. The sarcasm expressed in this question was directed at the German technology sector's sense of entitlement. Taking up the criticism of West Germany's research and technology policy, the article voiced a general disappointment with the dismal failure of national IT policy and constituted a turning point in the history of state-funded advancement of data processing. The federal government's innovation policy model was in crisis. Siemens and AEG, the German market leaders in data processing, had been the two of the main beneficiaries of the federal government's strategy to promote the West German IT industry in its first decade. As *Computerwoche* pointed out, neither company had been able to reduce the considerable gap between themselves and the global market leader, IBM, or to put an end to the pre-eminence of US hardware manufacturers. It was only a small consolation that, thanks to European research cooperation and promotion schemes, the Federal Republic began to take the lead in the microelectronics race against East Germany. A decade previously, the press had rhetorically announced the battle for "technological progress" and framed it as a question of national prestige. In times of competing political regimes, rather than the product of a certain "gift" and "ability to innovate" or even of an "inventive talent and genius", success tended to be a result of "free development" and the co-ordinated "initiative" of economic and research policy (Richardson / Parker 1968: 26; Rudzinski 1969: 11; Neues Deutschland 1968: 6). With the economic crises and socio-political upheavals at the start of the 1970s, the view on innovation changed. While achieving a definitive outcome (or *fait accompli)* of the competition between the two regimes noticeably receded, concepts of innovation policy soon took on the character of a remedy for the ailing German economy, which needed to free itself from recession and depression.

In this article, I will outline the central pillars of this discourse around innovation by comparing the roles of innovation policy in the GDR's socialist planned economy and in the FRG's democratic market economy. Innovation is a multifaceted, highly enigmatic concept (Godin 2015). There are numerous linear and holistic theories, which often grossly overrate the significance of continuities or path dependencies. Yet, in practice, product and process innovations prove to be the result of enabling circumstances and thus of complex interdependencies between supply and demand ("technology push" and "demand pull" factors). Innovations emerge from targeted actions, but they can equally happen spontaneously. Here, the particular circumstances intersect with institutional and individual operational strategies which turn out to be the effect of cultural imprints and patterns of behaviour. Therefore, processes of innovation can be understood as an interaction between systemic and cultural factors (Reith 2006: 18f.). In this article, I will explore the political discourses on innovation and their contribution to the implementation of certain innovation policies as well as their influence on the attitudes, values, models and approaches of the actors involved—that is politicians, researchers and businesspeople (Schramm 2008: 17).

The concept of "innovation policy" produced a radical change. Semantically, the policy of investment control in the Federal Republic at the end of the 1960s on the one hand evoked the frightful prospect of (centralised) planning; on the other hand, it conjured up the vision of a pan-European awakening. Thus, the concept of "innovation" defined the terms for the societal debate surrounding the conditions and effects of computerisation. Government, industry bodies and employers' associations along with trade unions fought for decades over the meaning and consequences of an "innovative" technology policy. Actions to promote hardware and software development were a crucial battleground. The central argument of this article will be guided by the observation that the ideas and concepts, values and scope of action ingrained in innovation policy in West Germany and the GDR up to the 1960s remained very similar and extremely stable (Fraunholz / Hänseroth 2012: 10ff.; Bauer 2012: 305ff.). Despite this, the transformation of both countries into a "digital society" differed sharply due to the circumstances of the Cold War. While the CoCom Embargo cut the East off from essential capabilities within the high-tech space, the Western European countries grappled with themselves over how to find an acceptable way of cooperating with each other. In this way, innovation policy proved to be a touchstone of European unification.[2] While the history of state-sponsored IT development in the two Germanies has already been studied in-depth (Krieger 1987; Bähr 1995; Sobeslavsky / Lehmann 1996; Salomon 2003; Wieland 2009), so far there have been few comparative approaches (Naumann 1997).[3] While more recent research papers have written the history of information technology from an international perspective (Coopey 2004; Cortada 2009; Pieper 2012), a study of the entanglements of global IT industries remains a desideratum.

2. Building Semantic Bridges: Innovation Culture and the Discourse surrounding the "Techno-logical Gap"

Technology policy in both the West and the East changed radically with the "shock of globalisation" (Ferguson 2010: 60). The promotion of data processing was given a key role at the end of the 1960s following of a heated debate over the European technological lag behind the USA. The debate had been initiated by the reports of the Organisation for Economic Cooperation and Development (OECD). In 1965, the OECD analysed the rise in research and development outputs in the USA and noted that in 1962 alone these were five times higher than in Western Europe (Freeman / Young 1965).[4] In March 1968, a series of studies by the Committee for Research and Technology Policy raised the alarm (OECD 1968). These studies shifted the discussion from the elite circles of experts in parliaments, committees and work groups to the mass media. In 1967, Jean-Jacques Servan-Schreiber, *Le Monde* columnist and editor of the news magazine *L'Express* and the business journal *L'Expansion*, coined the phrase "the American Challenge". He kept reiterating the findings of the OECD study: "In the industrial war now being waged the major battle is over computers. This battle is very much in doubt, but it has not yet been lost. […] What we do with computers will tell us whether Europe is still alive!" (Servan-Schreiber 1968: 147f.)[5] In West Germany, this discourse on "Americanisation" and "closing down sale in Germany" (Blauhorn 1966: 240; Blauhorn 1970; Steinbuch 1968) as a result of IBM's triumphant success caused a stir. "Buy German" was the order of the day.[6] While people were largely in agreement over the *reaction* to the supposed calamity, opinions about the *causes* of Europe lagging behind in computer production diverged greatly. While the OECD stated that there was a lack of "innovation capability", John Diebold, head of Diebold Management Consulting and adviser to the US State Department attributed this gap above all a failure of "management" (Diebold 1968; cf. Hilger 2004a: 69–87). Equally, Gerhard Stoltenberg, the German Minister for Research, who supported Servan-Schreiber's plea for an "effective Federation of Europe", interpreted the "technological gap" as a "political" one (Stoltenberg 1968a: 154f.; Berger 1968).[7] His concept of a "new research policy" recognised that the development of several data processing systems was indispensable for research and economic policy.[8]

In the USSR, on the other hand, the concept of an enduring technology policy was an integral part of the promised "scientific and technological revolution". At the same time, there was a controversy about the relationship between innovation, intuition and planning (Hoffmann 1978: 622). This debate, which looked at the general framework and conditions of cutting-edge research, more than anything set the tone for the academic discussion about innovation in the GDR (Haustein / Ivanov 1979; Haustein / Maier 1985; cf. Rupp 1983). In the East German press, the problem of the technological gap was primarily discussed as a phenomenon of foreign capitalist countries. The Secretary of the Central Committee, Erich Honecker, was quoted by the newspaper *Neues Deutschland* as saying, "the leading role of the Soviet Union in many areas of academic and technical progress" and the "world class status" of research in the East was indisputable (Honecker 1967: 3). A sizeable level of furore was created primarily by the memorandum of the Russian nuclear physicist and dissident Andrei Sakharov. In his view, the USSR could now only really overtake the USA "in some of the old, traditional industries [...] [whereas] in some of the newer fields—for example, automation, computers, petro-chemicals, and especially in industrial research and development—we are not only lagging behind but are also growing more slowly, so that a complete victory of our economy in the next few decades is unlikely" (Sakharov [1968] 1973: 68). Naturally, the GDR's leadership had a different view. Walter Ulbricht calculated that "with research organised correctly" the gap could be bridged within "a relatively short time" (Ulbricht 1969: 3f.). This would be possible because, according to Ulbricht, in contrast to the capitalist enemy of the people, the socialist state was "correctly programmed" (Neues Deutschland 1970: 7). But, it was claimed, there were differences in mentality. They were given as the reasons why the GDR was lagging behind the US, namely out of a propensity for "traditional behaviours now surpassed, old habits" and the "notion of carrying out important development works at a steady pace, as it were, one step after another, without taking into account, that the development of technical research was progressing at increasing speed elsewhere in the world." In short, Ulbricht changed the meaning from "technological gap" to "ideological gap" (Ulbricht 1969: 3f.).

3. European Perspectives and National Exceptions: Technology Policies in the Cold War Era

a) Supporting the Progress of the IT Industry in West Germany

In the Federal Republic of Germany, a concerted effort to promote data processing began in July 1967.[9] In a "memorandum" of the same year, Stoltenberg emphasised the meaning of promoting IT nationally: "Until very recently, data processors were almost exclusively used to carry out calculation tasks for academics, engineers or accounts [...] only more quickly and with fewer mistakes than humans can." Since then, however, computers have come a long way towards becoming "active partners" in everyday life:

> They take on the role of a teacher, passing on fundamental knowledge through exercises, and that of a nurse, monitoring the vital functions of the critically ill. They are included in the way businesses and public administration are organised, by fulfilling their basic tasks, collecting, transmitting and summarising information. In manufacturing, they regulate the machines and on the street, the traffic. (Stoltenberg 1968b: 139)

In connection with the German Research Foundation's basis programme on "information processing", the West German government established a system to promote academic teaching and research in the field of computer technology, which was supposed to apply to both the development of IT infrastructure and the application-based training of IT workers. Between 1967 and 1977, three public subsidy programmes were implemented. They amounted to around 3.7 billion Deutsche Mark (Wieland 2009: 155). From the outset, Siemens and AEG were among the largest beneficiaries. In the first IT programme, 87% of the funds went to the two manufacturers; in the second programme, their share was still 68%. The promotion of individual companies and large computing businesses proved to be a failure and the public became noticeably more critical when success of this policy failed to materialise and the economic crisis hit. During this time, the Ministry of Research started to devise plans to bring the two industry leaders together in one union ("Großrechnerunion"). This approach petered out just as quickly as all comparable initiatives to establish a "Deutsche Computer AG" (Hilger 2004b: 338).

With great pathos, the critics of this model of national "champions" evoked a common European "spirit" (Bößenecker 1974). In fact, from 1971–72 three of the largest European computer companies—Siemens, CII and Philips—were negotiating the conditions for the creation of a European computer business, Unidata. However, the consortium established in 1973 proved to be fragile and broke up after almost two and a half years, when the French Compagnie Industrielle pour l'Informatique (CII) withdrew from the union. Under President Giscard d'Estaing, the French government preferred contracts with US manufacturers over the European solution. In the spirit of Charles de Gaulle's national *plan calcul*, on 20th May 1975, they agreed the merger of CII and Honeywell-Bull (Griset 1999; Hilger 2008: 143f.). The vision of a European IT company as a "bastion" against the overly powerful IBM had failed before it had begun.[10] In particular the supranational structure of the organisation proved to be a trial of strength, which in the end was beyond the capacities of the businesses involved (Kranakis 2004: 233–237). The British position attracted particular attention. The British Minister of Technology, Anthony Wedgwood Benn, gave a speech to the German Council on Foreign Relations on 20th February 1968, outlining the way to a pan-European solution to the technological question with the foundation of a "European Institute of Technology". [11] However, in the aftermath of the ill-fated EC accession negotiations, all plans aimed at strengthening the European Economic Area broke down. Thus, Unidata ended in a fiasco.

It lasted until the start of the 1980s, that is until the implementation of a new, concerted European initiative to promote cooperation in the IT sector.[12] This new policy chose not to support established companies, but followed the successful American model of supporting smaller start-ups. Hence, on 13th December 1983, the West German Foreign Minister, Hans-Dietrich Genscher told the general meeting of the Confederation of German Employers "if we do the right things, then Silicon Valleys are also possible here". He was encouraging them to emulate the model of the US high-tech region (Genscher 1985: 422). In the mid-1970s, the "technological avant-garde" of the Bay Area had become the central point of reference for West Germany's enthusiasm for technology (Held 1976: 6; Helmer 1978: 15; Gaul 1983: 34). American success originated primarily in the "military-industrial-academic complex" of the high-tech region, but public debate in West Germany focused predominantly on the new influence on the state-funded research and technology policy and in particular on the venture capital factor (Sternberg 1998: 300ff.). Nevertheless, in the mid-1980s this enthusiasm remained strong. There were only small pockets of criticism of Silicon Valley companies' capitalist drive for performance, the extraordinary stress levels, the drug excesses and often shattered family structures, but also for the moral conflicts of the information technologists (Der Spiegel 1984: 66–77; Rügemer 1985; Herding 1985: 60). In 1983, in an interview with the *Bild der Wissenschaft* magazine, the German Minister for Research Heinz Riesenhuber enthused about the mythical *Valley of Silicon*: "When you see, how in and around American research centres, such as the "Silicon Valley" in California, young researchers spontaneously found new companies, in which they quickly put into practice what they have learnt about technology and the workplace in these centres: it can make you envious." (Riesenhuber 1983: 58) The challenge was that the myth of the start-up in a Californian garage, encouraged by the local subculture, did not apply to the realities of the West German research and technology sectors. Until the 1980s, the IT sector was dominated by a handful of established companies which had evolved over decades.

Nevertheless, the government, spurred on by the ever rising media euphoria, benefited from the credo "small is beautiful" (Schumacher

1973; cf. Gall 1999: 135f.). With the foundation of the German Venture Capital Society (Deutsche Wagnisfinanzierungsgesellschaft, WFG) in 1975, a first step towards the provision of risk capital was made. The capital was provided by 27 credit institutes, whose commitment was guaranteed against losses of up to 75% by the West German government. The WFG took stakes in the innovation plans of small and medium-sized enterprises by acquiring business shares, which a company's shareholders could buy back once their plans had been successful. Clearly, the government was striving for a proportionate method of supporting these young companies. In the first 18 months, 167 ideas out of 600 applications seemed testworthy. Of these, only three received investment from the WFG, as Volker Hauff, parliamentary secretary of state in the Federal Ministry for Research and Technology reported to the *Frankfurter Allgemeine Zeitung (FAZ)* in March 1977. In the *FAZ*'s series, "innovation—preserving by changing", Hauff pointed to the increasing significance of "promoting innovation" in small and medium-sized businesses after years of hesitant federal venture capital investment (Hauff 1977: 3). The WFG promoted primarily start-ups in the high-tech space: around 32% of support went on applications from the information and communications sectors (Gaida 2002: 238; Mayer / Müller 1991: 37f.).[13] Admittedly, the risks were high. Only eight of the nearly sixty investments brought in any profits once the government had sold its stake back. Frequently, the "Wagnis Gmbh" had to prepare for the disproportionate demands of supposedly "ingenious inventors" (Blüthmann 1975: 22). Thus, the failure rate of the projects support by a total of nearly 70 million Deutsche Mark of investment capital was a considerable 30%. Nonetheless, the creation of the WFG was an expression of the gradual shift towards a coherent West German innovation policy at the end of the 1970s (Trischler 2001: 63).

b) The Innovation of Copyists: Promoting IT in the GDR

Rather than Silicon Valley, the GDR looked towards research institutions in the East as role models. Among these models for the East German data processing industry were the computer science institutes in Moscow, Minsk and Kiev. In this area, the West and East German myths of the computer as the technology of choice for the future bore a strong resemblance. Computer scientists in the East soon took on the mantle of "magicians" and "sorcerers" (Stern 1956: 11; Beckert 1968: 4). Between Western and Eastern Europe, and to the greatest extent between West and East Germany, an innovation gap had been growing since the mid-1950s that could no longer be put down to the greater war damage in the Soviet Occupied Zone. The 1960s saw the increasing economic isolation and a lack of "world market integration" of the Soviet Bloc states. This, more than anything else, prevented them from catching up technologically. In the West, the participation in the global market, the support through technology transfers from the US and finally the implementation of regulatory measures, among them the European Recovery Program, had set the dormant West German economy on an upward trajectory (Hardach 2000: 200ff.). In the GDR, which had been weakened by the dismantling of vital infrastructures, the exodus of its elites and the relocation of businesses, this type of support was conspicuous by its absence. New research emphasises the meaning of "innovation blockades". This was the reason why the GDR, as Johannes Bähr argues, was above all lacking the flexibility required to react adequately to unexpected circumstances and exogenous shocks (Bähr 2001: 38–42; Augustine 2007). For example, in microelectronics, the West Germans acted considerably faster than the East German planning authority and companies. This proved to be the case, particularly as the development of a self-sufficient national microelectronics industry suffered through the failure to create an effective division of labour with the Council for Mutual Economic Assistance (COMECON). The "refusal to co-operate" (Barkleit 2000: 28) of individual Bloc states slowed such processes significantly. Thus, despite extensive technology imports, COMECON countries could not keep up with the digital revolution in the 1970s. The strategy was to outdo the West by importing fully developed technologies and the "avoidance of detours" involved in research (Buchholz 1975)—in order to, in the spirit of Ulbricht, "overtake capitalism without catching up to it" (überholen ohne einzuholen).

Pioneering work had also begun in the GDR during the 1950s. The starting gun for promoting computer science and data processing was fired in December 1963 by a resolution of the Council of Ministers on "immediate measures for the development of data processing". Within a year, the government committee of the Socialist Unity Party of Germany prepared a "Programme for the development, introduction and implantation of machine data processing in the GDR". This also encompassed a plan for information technology training within universities. The "Kader" working group conceived study programmes, designed to train more than 25,000 specialists for the production and maintenance of computing machines. Of those, the bulk would be skilled workers employed in computer installations. The technocratic belief in the GDR's victory in the "battle" of the systems was at its height during these years (van Laak 2001: 100f.). In June 1970, a "Programme for the Development of Electronic Components and Devices" (Sobeslavsky / Lehmann 1996: 59–78) followed. As a result, the promotion of IT became a cornerstone of the "New Technology" and the "New Economic System of Planning and Direction" since 1963 (Steiner 2001; Cortada 2012).[14] However, the leadership's planning soon reached its limits. The GDR possessed its own means of microelectronics production. Within the terms of the multilateral treaty on computer science (ES EVM) between the People's Republics of Hungary, Bulgaria, Poland and the USSR, the GDR's production capabilities contributed to the manufacture of production lines in both mainframe and microcomputer technology. This expressed itself in the creation of a "Unified System of Electronic Computers" (ESER), which was intended to compete with the IBM System/360. The COMECON countries also undertook successful experiments in the 1960s and 70s in the fields of data transmission technology and computer networks, in particular within the large research institutes. However, in practice, an ability to improvise was required. Cooperation agreements with hardware manufacturers "behind" the Iron Curtain rarely succeeded (Herrmann 2012: 223f.). If personal tensions and a lack of clarity had already restrained a large proportion of the workforce,[15] in the mid-1960s, the increasingly efficacious stipulations as a result of the West's high-tech embargo dealt the East German computer industry a heavy blow (Donig 2009: 95ff.).

As the gap between the GDR and its Western competitors (especially market leader IBM) grew larger, the party leadership sought ways and means to get around the restrictions of the embargo. The Ministry for State Security (Stasi) devised new strategies. From 1960, the Stasi had an "informal collaborator" in Munich, who reported as IM "Sturm" from IBM's Munich office and the factory headquarters in Sindelfingen. After his emigration to the West, "Sturm", alias Gerhard Arnold, had risen through the ranks of the company. Within ten years, he climbed from being an assistant to computing specialist, systems analyst and key accounts sales manager to the head of systems analysis and head of sales. Through him, until the mid-1960s, the GDR's foreign intelligence service was able to foster a "source location in a position vital to the development of computers". The Stasi achieved this with "many years" worth of IBM development documents placed at their disposal immediately, which could be evaluated and prepared for their own development" (Müller / Rösener 2008: 78f.).

After leaving the company in 1970, Arnold founded a management consultancy. He continued to provide the GDR intelligence service with further information and international client contacts.[16] At first, he had merely sent material that had already been published and that IBM provided to its clients for marketing purposes or in the process of marketing mainframe systems. Later, in a somewhat foolhardy endeavour, he transmitted detailed technical documents and precise construction diagrams, which were necessary to reproduce individual machines such as the IBM/360. In doing so, he undermined the requirements of the 5th Plenary of the Central Committee. Its stated intention was to "develop a socialist enterprise, which can compete with the largest foreign capitalist enterprise, IBM".[17] Notwithstanding the official propaganda, the GDR's leadership was sceptical of its own IT sector's prospects, as documented by an internal memo dating from June 1965. It stated that, as in the field of organisational technology, the sector had "great difficulties, which had their causes in our all too narrow experience". The planning and development of "mid-sized data processing systems" had "begun rather late" and the work which needed tackling had been "underestimated". Supposedly, a "danger" existed that the use of data processing systems in the years to come would remain hesitant "due to a lack of knowledge" and result in massive "losses". The authorities succinctly concluded that, "the sourcing of wide-ranging documentation from foreign capitalist countries can aid us to solve this problem".[18] Yet a gap remained to the world class "that cannot be closed even by 1970".[19] This was also visible in the number of IT systems installed. In May 1978, the GDR counted around 680 computer systems and 1,900 microcomputers. In West Germany, there had been 17,000 computer systems in the year before (in 1977 alone 300 systems were added) and 17,000 microcomputers (Hübner 2014: 205f.). In the United States, at the turn of the 1970s, almost 70,000 processors had been installed (Leimbach 2010: 99). At the beginning of the 1980s, the number of computers produced in the US exceeded a million. In the field of industrial robotics, the gap was equally as wide.

The realm of home computing spelled the next disaster. The "Resolution on Acceleration, Production and Application of Microelectronics in the GDR" dating from June 1977 was too late to turn the ship around. On the 1st January 1978, the state microelectronics holding company in Erfurt outlined its responsibilities in this area. Here, likewise, "development based on foreign models" led to a strategy of "re-invention" and "reverse engineering". This only cemented the gap between the East and the West.[20] The hunt for the 1 megabyte chip was emblematic of this. Although it was monitored with great enthusiasm in the GDR, it ended in a fiasco, as well. When the memory chip was finally presented in 1988, it was hardly state-of-the-art by this point. In order to be mass produced, the chip needed the Toshiba model and thus a newer import of Western technology (Klenke 2008: 58–63; Macrakis 1997: 80–85).

4. Conclusion

In the case of West Germany, the steps towards a common IT policy paved the way to European integration. Despite all the differences of opinion that remained, the British Minister of Technology, Anthony Wedgwood Benn, saw the computer as a vehicle for international cooperation. For him, the "infrastructure of information transmission" was a central "nervous system" of modern, increasingly globally networked societies.[21] Admittedly, the innovation culture of the 1960s and 1970s was largely a reaction to the "American Challenge". In promoting IT, however, European initiatives also started to gain traction. In spite of all the enthusiasm for a model of European unification, reservations about convergence and abandoning the self-sufficiency of a nation state at once gained the upper hand (Ambrosius / Franke 2013: 13). The case of the GDR impressively illustrates that the persistence of national data policies, which were in conflict with the standardisation of the organisational, technical and institutional requirements of computerisation, remained efficacious. During the Cold War, this influence was felt well beyond the borders of the Eastern Bloc, particularly in the "effects of the emergence of computerisation" and the "imponderability of development". National data policies would soon neutralise the best laid plans of technocrats. Nevertheless, in the 1960s, societies run by state socialism had begun to enter the information age, employing huge financial and personal resources. The promotion of computer science and data processing in the countries of the Eastern Bloc was carried out with similarly ambitious research programmes and initially cycles of innovation comparable to Western Europe. Moreover, in the GDR the cybernetics boom advanced the establishment of information technology (Danyel / Schuhmann 2015: 299). Fatal political decisions, the obstacles of bureaucratic planning, conflicts within collaboration and the division of labour within the COMECON, and finally above all the lack of funds for investment impeded the process. The following, however, was true for both East and West: the digital "lift off" was the result of complex social agreements. Future researchers therefore will have to take further actors into account. Along with the users of computer technology in both the public and private sectors, managers, lead engineers and IT specialists in up-and-coming computer industries had a significant impact on the way cultures of innovation evolved.

Notes

1 Where applicable, German quotes have been translated into English.

2 Integration was the stated aim of West Germany's European policy. At the same time, the turbulent years of the 1960s and 70s proved to be a "period of crisis for European unification" (Bührer 2000: 248).

3 For this reason, at the Centre for Contemporary History in Potsdam, currently several studies on the social history of computerisation in West and East Germany carried out under the direction of Frank Bösch are taking shape. Among the topics covered are the adoption of the computer in policing and the secret services, hacking as a subculture, the digitisation of the banking sector as well as the introduction of computers to governmental administration.

4 In the 1950s, IBM alone received nearly 400 million US dollars from the government; therefore, around 70% of its R&D expenditure was funded by the state. Over the decade, the United States invested around 135 million US dollars per annum to promote IT research. Thus, in 1963, the government contribution to R&D expenditure in the US was 61.8%. In the United Kingdom it was 36%, in France 30% and only 4% in Germany (OECD 1967).

5 The OECD reinforced the concerns: "The computer industry is the key element in the information revolution, just as the steam engine was the key element in the industrial revolution. Its importance lies not only in its economic output, which is already considerable, but in its far-reaching effects on the whole economic, industrial and social structure of a country." (OECD 1969: 15) See OECD Archives. Secretary-General's Speeches. "L'écart technique entre l'Europe et les Etats-Unis" (10.11.1967).

6 Siemens Corporate Archives. SAA 35–77 Lp 5, Pos. 537–540; SAA 35–77 Lp 75, Dr Heinz Janisch, Folder 3.

7 The demands for a stronger federal engagement in research policy and the calls to end the "laissez-faire economic

policy" had its origins in the zeitgeist of the devotees of central planning. BA Koblenz B136/5978. In the "long" 1970s, however, the meaning of "gap" immediately evolved to express a recognition of the crisis. This was defined by the "Age of Uncertainty" announced by the economist, John K. Galbraith (Geyer 2016: 283–287).

8 BA Koblenz B138/5531, f. 370, and B138/5532, f. 40ff.

9 The allocation of federal funds for academic research followed a programme which had been agreed with the federal finance minister on 17 July 1967. This was done according to the concept adopted by the Cabinet Committee for Academic Research, Education and the Promotion of Training in April 1967. BA Koblenz B138/5531, f. 6.

10 Siemens Corporate Archives SAA 21945; 22839; 22519; 22640; 22752.

11 Benn placed great emphasis on the importance of potential cooperation in the field of technology. He saw it as a "way Europe's wounds can be healed and a way that our old, creative continent can gain new strengths". Benn: "Technologie und Politik", 20.02.1968, p. 15f. BA Koblenz B136/5978. In a similar way, the British Prime Minister Harold Wilson pleaded for the establishment of a new "technological community". In this context, the Italian leader, Amintore Fanfani initiated a discussion about a "technological" re-vamp of the Marshall Plan.

12 The FAST-Program was the first approach (Forecasting and Assessment in the Field of Science and Technology) from 1978–1983. In the IT sector and until 1998, the European Strategic Programme for Information Technology (ESPRIT) defined research cooperation as a network of the 12 largest electronics companies.

13 On the WFG's processing of allocation risk capital, see for example the protocol of the Selection Panel: BA Koblenz, B 196/19898–19900 and B196/73733.

14 In the "societal evaluation of innovations", GDR journalism drew a sharp distinction between capitalism and socialism. "Discovering, inventing, and promoting new things all round and using them productively" was "not a task, divorced from the people and for a small number of specialists or researchers". Instead, it was "required by social economics". They said the West took "the individual calculations of private capital as its starting point" for making evaluations and therefore forgot the "social and economic consequences" of innovation. This was especially the case in its "aggressive pursuit of defence R&D". Meanwhile, socialism understood, as the story went, "the development of science and technology" precisely in the "creative collaboration of the workers in the working out of and realisation of plans" as a motor of the common "societal progress" (Hartmann 1981: 7–33).

15 Nevertheless, there were successful technological research initiatives both inside the Bloc states and between East and West. See for example Sächsisches Staatsarchiv Dresden 11594 VEB Kombinat Robotron, Nr. 395; 1625; Insti-

tut für Datenverarbeitung: “Plan Neue Technik”. A comprehensive history of the German computer industries remains to be written.

16 BSTU MfS HV A 593, Part 1, f. 108–110. On Arnold's mission, see BSTU MfS HV A 593, Part 1, f. 194–205. For his services, Arnold received the Friedrich-Engels-Prize and the GDR's Medal of Honour. In the wake of the unmasking of the Stasi's agent handler, Werner Stiller, 15 high-ranking officers and operations were revealed. Altogether, the informal collaborator “Sturm” had operated as a spy for nearly 20 years. After the end of his detention at the end of the 1970s, he was sentenced to 2 years. According to Stiller, Arnold as well as Wilhelm Paproth, another IBM employee (codename “Wolfgang”), were “without exaggeration the fathers of the data processing machines in the GDR” (Stiller 1986: 198–209; Der Spiegel 1992: 123).

17 BSTU MfS HV A 830, f. 99.

18 BSTU MfS HV A 593, Part 2, f. 388.

19 BSTU MfS HV A 594, Part 2, f. 431f.

20 With resignation, the Stasi, holding the technology portfolio during the embargo, had to declare that “in the GDR the know-how is not available to master comprehensive systems design of complicated micro processors”. BSTU, ASt. Erfurt, Abt. XVIII, No. 7, f. 18–21. The copycat strategy was not unique to the East German IT industry. In Western Europe, this strategy and its form of “reverse engineering” were also very commonplace.

21 Benn: “Technologie und Politik”, 20.02.1968, p. 8. BA Koblenz B136/5978.

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