

TECHNOLOGY TRANSFER, MODERNIZATION, AND THE WELFARE STATE

*Regnecentralen and the Making of Governmental Policy on
Computer Technology in Denmark in the 1960s*

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Abstract: This paper will address the mechanisms of computer technology transfer and the perceived role of computers in the modernization project of the Danish society, by analysing the early computer projects in Denmark. Especially it focuses on the similarities between the perception of computer technology and the visions of the welfare state as a modern, science bases and rational society.

Key words: Computers, welfare state, Denmark

1. INTRODUCTION

In the last decades, the study of the history of technology has increasingly followed the same trends and development as we can find in general history. Social constructivist approaches, actor-network analysis, and discourse analysis are often used techniques, and we can hardly find any historians of technology that does not take the social and/or political context in account in his studies.

The following article has two parts. In the first part, I will outline the transfer of computer technology to Denmark. This resulted in the creation of Regnecentralen, which was responsible for constructing the first Danish computer, DASK, in 1958. After a short description of the emergence of the welfare state in Denmark as a necessary context for the second part, I will look at the first attempt at forming a governmental policy regarding the use of computers in local and national government. This case shows how

different conceptions by the various actors of the role and nature of computer technology defined their views on the necessary policies on the computer field.¹

2. TECHNOLOGY TRANSFER

In his study on the political reactions to the introduction of computer technology in Sweden, Hans De Geer set up four stages:

1. Information or technology awareness: In this first stage, you get aware of a new technology's existence. Mostly this happens through personal contacts on the scientific-technical level.
2. Technology transfer: A more precise knowledge about the new technology's nature and possibility evolves, and we obtain new information in a systematic manner. We test the technology and gain the first experiences.
3. Technology diffusion: We use the technology more extensively and survey the needs and possibilities. The first official surveys and reports appear.
4. Consequence handling: Consequences for areas such as employment, education, policies, and organizational changes emerge.²

The first information of the new computer technology came to Denmark through Sweden. When Stig Ekelöf returned from his fact-finding trip to the USA in 1946 (see Anders Carlsson's article), he gave a report on his findings at a meeting of the interested parties in September 1946. Amongst the participants was Prof. Richard Petersen from the Danish Technical University. On his initiative, the Academy of Technical Sciences (an organization parallel to the Swedish Ingeniörvetenskabsakademien)³ formed a special committee, Committee on Computing Machinery, which should monitor the international developments on the field of advanced

¹ This article was originally written as a paper for the annual meeting of the Society for the History of Technology in San Jose, CA. 2001. A more detailed narrative can be found in Per V. Küver: From Research Institute to Computer Company. Regnecentralen 1946-1964. *IEEE Annals for the History of Computing*, Vol. 21, no. 2 s. 31-43. In the present article though, theoretical and more general considerations, which had been omitted in the above-mentioned article, will be highlighted.

² Hans De Geer: På väg til datasamhället. Datateknikken i politikken 1946-1963. KTH, Stockholm 1992

³ Formed in 1937, its purpose was to promote co-operation between science and industry and the utilisation of applied science. It consisted of various non-commercial laboratories, special working groups etc. It also played a role conducting scientific surveys and offering scientific expertise for government. P.O. Pedersen: *Akademiet for de tekniske Videnskaber*. Copenhagen 1938

computing machinery. The members of this committee were professors from the Technical University and from the faculty of science of the University of Copenhagen, who shared an interest in the use of numerical methods in their special fields.

The minutes from the meetings of that committee clearly indicates, that the members did not have any clear ideas of the possibilities and nature of the new computer technology, and naturally they were exploring all developments, studying reports and publications and obtaining reports from Danish scientists staying primarily in the USA and Britain.⁴ A major source of information was the close contacts with Swedish colleagues.

At first, the RMU concentrated its efforts on analogue differential analyzers. We do not know if Ekelöf and Hartree played a role in this decision, but both were experts in that technology. Ekelöf had recommended the procurement of differential analyzers in Sweden before the war.

The Danish Technical-Scientific Research Council (Danmarks Teknisk Videnskabelige Forskningsråd (DTVFR) decided in February 1948 to grant financial support to the construction of a differential analyzer similar to the machines constructed by Vannevar Bush⁵ and simultaneously to support experiments in the use of electronic calculators in solving linear equations by Professor Rybner at DTH.

Building an electronic digital computer in Denmark was out of the question at that time. All economic resources were reserved for reconstruction of the Danish economy. Especially US-Dollars were scarce, since most of the Danish exports went to Britain (more on that later). Should they obtain advanced computer technology, it was necessary to find a solution that would put a minimum of strain to the nation's reserves of foreign currencies. This constraint was one of the main reasons why the committee, with some enthusiasm, tried to persuade UNESCO to locate the planned International Computation Centre in Denmark. However, they delayed these plans due to political and commercial conflicts, the committee's interest cooled off.⁶

⁴ Archive of Akademiet for de tekniske Videnskaber (AtV). Erhvervsarkivet (Archive for Trade and Industry), Aarhus Box 19(B) and Box 6A.

⁵ It was completed around 1956. See Eyvind Frederiksen: Den første danske Differential-Analysator. In *Ingeniøren* nr.17 Copenhagen 1952 pp. 280-290 og M. Fordsmænd: Den mekaniske Differential Analysator ved laboratoriet for anvendt matematik, DTH. In *Ingeniøren* nr. 33 Copenhagen 1956 pp. 652-656. AtV box. 76 letter February 3.1947.

⁶ The most comprehensive account on the International Computation Centre can be found in Eileen Marie Mahoney: *Negotiating New Information Technology and National Development: The Role of the Intergovernmental Bureau of Informatics*. Ph.D. Temple University 1987, especially pp 54-134. UNESCO/NS/ICC/1 and UNESCO E/1694/Add. 1

In the first half of the 1950s, it seemed more realistic to obtain funding for acquiring an electronic digital computer. The Korean War had turned the Cold War even colder, and the USA now started to put an increasing pressure on the Danish government to increase DK military expenditures - especially regarding the funds stemming from the Marshall aid. Military expenditures have never been politically popular in Denmark, and the Danish governments of very political color would rather use the funds for long-term scientific and technological research.⁷ However, here the Defense Research Council came to the rescue and outlined the need for computers for their research - and like their Swedish counterparts, they emphasized the need for ballistic computations and code breaking.

It was no harm, that some members of the Defense Research Council also where leading members of the Committee of Computing Machinery, especially Richard Petersen. They formed a joint committee and in late 1952, an application was send to the Defense Ministry, requesting funds.⁸ A sum of 900.000 Dkr. (at that time approximately \$130.000) was granted in 1955 from the counterpart fund of the Marshall aid, making everyone happy. The Danes could start the construction of a computer, and they could tell the USA, that they had used the fund for military purposes!

In the meantime, Richard Petersen had used his influence to give the young engineer Bent Scharøe Petersen the chance to use part of his military service as an assistant in the construction team working on the Swedish computer BESK.⁹ Therefore, they decided that the Danish computer should be an improved version of the BESK- machine and hence the name – DANish version of BeSK – DASK. The military also insisted that it should not be responsible for operating the computer and bearing the financial risk in doing so. The obvious solution was to establish another institution under the auspices of the Academy of Technical Sciences. Therefore, they dissolved the Committee on Computing Machinery and founded Regnecentralen (RC).

from the UNESCO-archive at the State Library, Aarhus. Letter to Harald Bohr from R. Petersen 3.6.49, *AtV* Box 19 (B), Erhvervsarkivet Århus

⁷ Leon Dalgas Jensen: *Dansk forsvar og Marshallplanen*. In *Historisk Tidsskrift* 1991 bd. 91, no 2 p. 459-506

⁸ Letter dated 29. sept. 1952, j. nr. FFR 31/52, *Archive of Forsvarets Forskningsråd. ATV-archive*, op.cit. Box 216.

⁹ Also another young engineer, who came to play a significant role in the construction, Tage Vejlø, was soon involved in another Swedish computer project, SMIL in Lund. Interviews with Tage Vejlø and Bent Scharøe Petersen. See also Bent Scharøe Petersen: *Dasks' første år*. In Poul Svejstrup et. al: *Niles Ivar Bech – en epoke i edb-udviklingen i Danmark*. Copenhagen 1976 pp. 15-20. The book is now available on-line on <http://www.datamuseum.dk/rc/NIB/>

The reason for constructing a computer instead of buying a commercial computer was partly economical, but it was also because the members of RC were convinced that the operation and maintenance of a computer required a degree of knowledge about its construction that they could only obtain by active participation in the construction of the machine. In addition, research in new scientific methods and techniques utilizing numerical methods and the use of computer technologies they could best obtain by solving practical problems. This would also be the best way to develop courses in coding and planning and identifying possible applications for science and industry. Therefore, it made sense from a research point of view that RC should be directly be involved in running DASK. As we shall see, this hands-on approach would have a direct impact on the views and beliefs of most of the academic milieu on computer technology in the conflict that follows.

They decided not only to copy the Swedish BESK, but also to incorporate a number of improvements that were the result of experiences gained by computer projects around the world. The construction was a shoestring operation. For instance, they applied the magnetic coating of the magnetic drum with the assistance of a modified vacuum cleaner. They assembled core memory on kitchen tables by the wives of the members of the small construction team.¹⁰ After two years, DASK became part of the Danish Defense Ministry on the 13 February 1958, well within the planned time schedule and budget. They presented DASK to the public a couple of months before that, at a big Electricity and Atoms Fair in Copenhagen. They installed a data transmission line and the astonished audience could have their income tax calculated in record time.¹¹

DASK was a success and used for technical and scientific computation for Danish industry, mainly shipyards, telephone companies, and machine works, while military computations only played a minor role.¹² RC expanded the activities by creating departments for engineering computations, operations analysis, office automation, mathematical analysis, and electronics engineering in order to develop and promote new numerical methods and computer technology in general. They arranged a number of courses in programming and the application of computers, and RC became very active in developing the Algol-language. The Director, Niels Ivar Bech, was an inspirational and enthusiastic leader, who formed a creative

¹⁰ Interviews with Bent Scharøe Petersen and Tage Vejøl.

¹¹ The presentation at the fair and the inauguration was reported by all national newspapers. They heralded DASK as an important step into the second technological revolution, f.x.: *Danmark i den anden tekniske revolution* Politiken 12.2.1958.

¹² A list dating from early 1960 has 308 different jobs from various companies. Bent Scharøe Petersens private Archive

working climate, where the employees were encouraged to disregard formal structures and co-operate across departmental boundaries.

RC hoped for the possibility to start the construction of a successor in order to explore new developments in electronics (transistors) and architecture - if necessary in co-operation with their Swedish colleagues. However, these plans did not materialize, partly because the Swedish Matematikmaskinnämnden (MMN) did not succeed in creating a permanent institution. Consequently, MMN lost most of his staff to a commercial company.¹³ Luckily, the Geodetic Institute came to the rescue. GI had some experience in using calculators for its computations, inspired by Comrie's work in Britain. Its leader, Ejnar Andersen, took the initiative that a small transistorized computer should be constructed in a joint effort by staff from RC and GI. Funding was in place by some creative budgeting by Einar Andersen, and the construction of GIER started.¹⁴

In the meantime, industrialist Haldor Topsøe made an inquiry into the possibility of purchasing a GIER-machine, since it seems well suited for process-control and calculations. Several more inquiries followed from the universities, and the board of RC reluctantly agreed in starting the production of a small series of 8 machines. It was never the intention that RC should turn out to be a computer manufacturer, its purpose was to promote scientific and practical research into the use of computers and the development of techniques and methods plus training and teaching in the same areas. Nevertheless, as we will see later, things turned out differently.

3. COMPUTERS AND WELFARE STATE

In order to give the following events a broader perspective, it is necessary to sketch the evolution of the political thinking and the emergence of a new social discourse such as the ideological basis of the Danish welfare state in the 1950s and 1960s.

In his study on the various types of welfare states, Gøsta Esping-Andersen identified three major types – the residual model, the social

¹³ Hans De Geer op. cit. pp. 36-45. Their plan was to create a Institute for Numerical Analysis.

¹⁴ Descriptions in Christian Gram et. al: GIER – A Danish Computer of Medium Size, in IEEE Trans Electronic Computers. 1963 pp. 629-650. Torben Krarup, "GIER: Den logiske struktur," *Ingeniøren* 1961 1961, pp. 716-720. H. Isaksson and Bent Scharøe Petersen, "GIER: Systemplanlægning og kredsløb", *Ingeniøren* 1961, pp 721-728. Einar Andersen, "Hvordan Gier blev født", *Svejstrup* 1976 op.cit. pp. 45-50. B. S. Petersen, "Gier", *NordSam* 60. Copenhagen 1960, pp. 13.1-13.7. H. Isaksson, "Kredsløbsteknikken i GIER," *NordSam &0*, op.cit. pp. 14.1-14.5

insurance model and finally the universal or Nordic model.¹⁵ The latter is characterized by a strong state and that every citizen has the right to obtain social benefits, which guarantees everyone a certain minimal standard of living. Taxes financed this universal system, which also shifts economic resources from the wealthy to the poor, and consequently promotes equality.

The welfare state was not the result of a master plan, but came because of new concepts on the role of the state¹⁶. During the Nazi occupation, members of the social democratic party and some civil servants had tried to analyze the basic problems of the Danish economy and the lessons learned of the world crisis in the 1930.¹⁷ Mass unemployment and social misery had proved to be a fertile ground for totalitarian political movements. It seemed clear, that a liberalistic, neo-classical capitalist economy could not guarantee adequate investments to guarantee full employment and economic growth. The obvious solution was that the state should play a much more active economic role on the macroeconomic level. Or as Keynes put it: "*I conceive, therefore, that a somewhat more comprehensive socialisation of investment will prove the only means of securing an approximation to full employment; though this need not to exclude all manner of compromises and of devices by which public authority will co-operate with private initiative.*"¹⁸

In addition to this, an analysis of the special problems of Denmark's economic structure supported the need for some sort of planned economy. The main problem was that the Danish economy was very dependent on the agrarian sector. They exchanged agrarian exports mainly to Great Britain for industrial goods, machinery, and energy (coal). Great Britain's post-war economic problems and the dollar crisis in the Western economy emphasized the need for a modernization of the Danish economy in order to make it less vulnerable. Supporting investments in industry should achieve this.

Inspired by Beveridge's program for creation of a social security system and new economic theories by Gunnar Myrdal and John Maynard Keynes especially the Danish Social Democratic Party outlined a reform program

¹⁵ Most international scholars have accepted this typology, although with some modifications. Gøsta Esping-Andersen, *The Three Worlds of Welfare Capitalism* Cambridge 1990

¹⁶ K. Petersen and N.F.Christiansen,"The Dynamics of Social Solidarity. The Danish Welfare State 1900-2000," in *Journal of Scandinavian History* vol26 no. 3, 2001 pp. 177-196; E.I. Schmidt, *Red velfærdsstaten* Copenhagen 1997. E. I. Schmidt, "Omkring velfærdsstatens tilblivelse," in *Note. Historielærerforeningen for gymnasiet og HF*, no. 131, 1996 pp. 3-8.

¹⁷ J. O. Krag and P. Gersmann, *Krigsøkonomi og efterkrigsproblemer*. Copenhagen 1944

¹⁸ John Maynard Keynes, *The General Theory of Employment, Interest and Money*, London 1954 (1936) p. 378.

along these lines.¹⁹ Instead of fighting for state ownership of the means of production, the goal was to guarantee a stable economy by state intervention and economic planning on the macroeconomic level combined with microeconomic liberalization. In order to create a competitive, export-oriented industry the use of rational, scientific based methods of production and science-based industries should have support, thus creating economic growth and a higher standard of living for everyone. This meant that the Social Democrats and the allied Labor Unions supported rationalization wholeheartedly.²⁰

During the late 1950s, they gradually adopted this line of thinking not only by the Social Democratic party, but also by influential civil servants. The use of experts and scientific analysis on social policy making in the broadest sense was furthered and institutionalized. The general idea was that by applying scientific analysis to economic and social problems, they could identify and prevent by rational measures by the state the causes of these problems.²¹

Because these policies presented themselves to be the result of rational and professional thinking and therefore a-political, the idea of the welfare State became the hegemonic thinking in Denmark during the 1960ies.²²

¹⁹ See for instance the program of the Social Democratic Party 1945 *Fremtidens Danmark. Socialdemokratiets politik*, Copenhagen 1945. In their working program in 1952 it said: "Danish Export has to develop a greater versatility and our dependency of a single market should be reduced." And on effectiveness the Working Program in 1953 stated: "Capitalistic disorganisation and waste in production and business should be avoided." The programs can be found online at <http://www.aba.dk/tekst/kilder/kilderTOC.htm#SD>.

²⁰ N.O. Finnemann, *I Broderskabets Aand. Den socialdemokratiske arbejderbevægelses idéhistorie 1871-1917*. Copenhagen 1985pp. 257-318. M. Rostgaard, "Fagbevægelse og teknologiudviklingen. Rationaliseringer og rationaliseringsdebat i Danmark i 1950erne", in *Årbog for arbejderbevægelsens historie*, 1990, no. 20 pp. 111-134, The same phenomenon can be seen in Sweden. See Anders Carlsson, "'Tekniken - politikens frälsare? Om matematikmaskiner, automation och ingenjörer vid mitten av 50-talet'", i *Arbeterhistoria* vol. 92, 1999, pp.

²¹ On the view that the welfare model and the idea of the interventionist state represented a new social discourse see N. Bredsdorff, *Embedsmandsstaten under ombrydning – økonomer, keynesianere og rationaliseringseksperter i efterkrigstidens centralforvaltning*. Roskilde 1999. Available online at <http://www.rub.ruc.dk/lib/omrub/publikationer/skrserie/skr28.pdf>

²² Especially the Conservative Party attacked the Welfare State as simply another form of socialism and called it the Paternalistic State. Klaus Petersen: "Himmel og helvede! Overvejelser om nogle temaer i velfærdsstatens begrebshistorie i efterkrigstidens politiske debat i Danmark" in R. Mariager, M. Mordhorst, K. Petersen (ed.), *Fortællinger i tiden*. Copenhagen 2001 pp. 103-116. The intimate connection between the use of science in

The 1950s saw some major reforms in the social area. One of the most important was the introduction of the Peoples Pension to replace the Old Age Pension in 1956. This reform introduced a tax-financed system with universal flat-rate benefits for everyone, thus being an example of the universal principle, characterizing the Nordic welfare model. The School Reform in 1958, the Rehabilitation Act in 1960, and the Public Assistance Act followed this in 1961. The latter two were notable for two aspects important in this context; Firstly they represented preventive social politics, secondly they removed the last remnants of the old Poor Law, were you could loose certain civil rights if you received social benefits.²³

4. FORMING POLICIES

As we have seen above, the formation of the Welfare State called for a more active and a bigger state. It needed more money through various taxes and then they redistributed it along the above-mentioned lines. However, there was a question if national and local administration was up to the task. Did it have enough resources to handle and process the amount of data that would be necessary if they should meet the new tasks of planning and governing?

There were doubts about that. In 1947/48 Viggo Kampmann, at that time head of the Economic Secretariat, which was supposed to analyze the economic consequences of government legislation and co-ordinate the economic policy, suggested to introduce a Pay-As-You-Earn (PAYE) tax in Denmark. It was scarcely possible to turn the tax screw any further within the existing legislation, which also had some other problems, especially if you risked unemployment. If they should solve these problems and more taxes generated and demanded while maintaining a socially just legislation, PAYE was a significant possibility. In contrast to Sweden and Norway, where PAYE was in operation, it was not feasible in Denmark of mainly two reasons. First there was a complicated system of deductions, and secondly because the tax administration was carried out by local government. A central registration would be necessary, if massive tax evasions should be avoided.²⁴

politics, professionalism and the emergence of the Welfare State see C.-A. Gemzell *Om politikens förvetenskapligande och vetenskapens politisering. Kring välfärdsstatens uppkomst i England*. Del I. Teoretisk inledning. Copenhagen 1989 (available on-line at <http://www.hum.ou.dk/projects/histtid/index.htm>).

²³ H. Christoffersen, "Dansk velfærdspolitik efter 1945", Copenhagen 1984 pp. 49-64

²⁴ Viggo Kampmann, "Skal vi have skat ved kilden i Danmark" in *Danmarks Kommunalforvaltning* vol.3 no. 3 pp. 32-35. With reference to Sweden he indicates, that

However, the only placed the idea in hibernation; it was not dead. In 1956, the Finance Minister Viggo Kampmann commissioned two reports on the use of data processing equipment (e.g. punched card equipment) in national government administration. The first rapport should survey the various punched card installations in order to rationalize the use of equipment. The second should investigate the feasibility and possible advantages in using electronic data processing (EDP).²⁵

The first report examined eleven out of the twelve national government punched card machine installations and they concluded that there was no coordination between them regarding use or procurement. The report suggested, at the largest installations should be combined. It also remarked that 90% of all machines originated from the same supplier, IBM.²⁶

It is remarkable, that they entrusted the second report to a consultant from the same supplier, Willy Olsen. The report concluded that there was a basis for creating an EDP centre that could co-operate with the existing national and local government data processing centres.

An the basis of these reports, Viggo Kampmann created a "Supervisory Committee of the Governmental Punched Card and Automation Services", with representatives from the Tax Department, local government, local government data processing and Regnecentralen. This committee immediately ordered a new report that should investigate which they could carry out national and local governmental functions with EDP within the next two to three years. Again, the choice fell on Willy Olsen – with the interesting argument that IBM probably would be willing to let him undertake the task without charge, since the state had indicated the willingness to by a computer! Because of the report, the committee recommended that there should be established a common centre for national and local government or, failing this, for national government alone.

The following discussions on the organization and structure of this centre would turn out to have a decisive impact on the states policies and organizations towards the use of computers. To give some background some

the introduction of PAYE at this time in Denmark would require expansion of the tax administration. The same point is made by S. A. Nielsen, "Kildebeskatning og skattefradrag" in *Fagskrift for Bankvæsen*, vol 7. Pp. 75-79.

²⁵ The various reports and minutes from the commissions meeting can be found in the following archives: *Forvaltningsnævnets Sekretariat – Videnskabeligt Computerudvalg 1946-1965*. Rigsarkivet (National Archive) Copenhagen. *Budgetdepartementet – Tilsynsrådet for Statwms Hulkort og Automatiseringsvæsen*, Box 37/1 and 38, Rigsarkivet, Copenhagen.

²⁶ *Rapport vedr. gennemgangen af hulkortvirksomheden indenfor statsadministrationen*. Forvaltningsnævnets sekretariat, aug. 1957. *Tilsynsrådet vedrørende Statens Hulkort- og Automatiseringsvæsen 1958-1960* Box 37/1 Part1. Rigsarkivet

short remarks on the relations between national and local government and the evolution of local government data processing appear below.

5. LOCAL GOVERNMENT DATA PROCESSING

Although Denmark has a long tradition for a strong state, the political system is characterized by being rather decentralized. During the political struggles in the late 19th century there was a deep conflict between the civil servants of the central government and the new political and social movements, which had its social basis in the countryside. The civil servants (and academics) were loyal to the ideals of the old elite and to the absolutist state, and were profoundly skeptical to the new political movements – and their counterparts mirrored that. Even after the parliamentary principle finally was introduced in 1901, the then ruling party, Venstre, were still hostile to central government bureaucracies. So this resulted in a political system, where important state functions like collection and administration of taxes, of social welfare, schools etc. was (and is) run by local authorities.²⁷ Defending its relative autonomy, local authorities therefore are very reluctant to any initiatives that would shift functions and power to national government.

That is why it would have been politically absolutely impossible for instance to create a central governmental data processing institution to handle a centralized PAYE-system, although that from a pure rational and efficiency point of view would have been the logical way to proceed. In the process of creating a central EDP-centre, local government interest therefore had to be taken into consideration.

Local government had indeed established data processing institutions, with IBM in a significant role. In 1947, IBM invited the municipalities of Copenhagen and Frederiksberg to discuss the use of punched card machines for tax calculations. In the following years, systems for that application were developed. At first, the systems were mainly demonstration projects to show the system's viability. Analyzing the process that followed from an actor-network point of view shows that IBM established itself as an obligatory passing point, which resulted in IBM being the only supplier of equipment for the centers established.²⁸ In 1952, they established the Kommunernes Hulkortcentral (Local Government Punched Card Centre) covering 22 local authorities on the island of Zealand. Gradually similar

²⁷ Tim Knudsen, *Da demokrati blev til folkestyre*, Copenhagen 2001 pp. 96-113

²⁸ The process parallels the introduction of EDP in Norway as analysed by J. Brosveet, *EDB inn i kommunene! Kommunedatatanken i et aktørnettverksperspektiv*. Trondheim 1996. See especially pp. 87-110.

centers were established as cooperation between local authorities. In 1956, they established a joint centre in Jutland and shortly after a similar centre covered the remaining regional area, the island of Funen.²⁹

Having made the principal decision to establish a central EDP-facility, the question remained which organizational structure it should have, especially regarding the local centers, and which guidelines should be outlined for the states policy on that area.

N.I. Bech from RC suggested, that the state should order a large-scale computer immediately, since there would be a long time for delivery. RC's board also put forward a letter of 16 November 1958, which included a detailed suggestion that DASK be utilized promptly for data processing in some of the most obvious areas. RC would assist with the necessary planning and coding work and supply qualified personnel at a reasonable tariff. This meant that the necessary experience could be harvested enabling the organizational and technical questions for the proposed centre to be thoroughly grounded. Simultaneously insufficient usage of the planned large computer installation would be avoided during the start up phase. It gave the possibility of training the necessary personnel for the extensive tasks ahead. The lack of qualified personnel was seen as the major bottleneck hindering the introduction of EDP - education and training was therefore of major importance.³⁰

The other members of the committee turned down this proposal. Especially local government representative Kock Nielsen opposed. Bech on the other hand criticized the local government's plans to upgrade their centers with IBM computers without coordinating their plans with the planned national centre. The discussion also revealed different interpretations on the role of RC – while some members saw RC as acting like a commercial company, RC saw itself as a non-profit organization which ultimate aim was to develop professional competence and act as a neutral consultant for state and industry.

The committee then founded a working group to discuss the organizational structure of the national centre. Five different models were part of the discussion:

1. National and local governments establish a combined centre that would handle planning, programming and machine operation.

²⁹ The most comprehensive account on the use of automatic data processing in Denmark can be found in Lars Heide, *Hulkort og EDB i Danmark 1911-1970*. Aarhus 1996. On the use in tax administration see pp. 86-96, 229-233. On local government DP-institutions see A. Laursen, ed. *Historien om en central*. Aalborg 1991 pp. 13-33.

³⁰ Regrettably the archive of RC was destroyed. Only one copy of the minutes of the meetings of the board of RC survived, rescued by Aage Melbye (hereafter called *Melbye Archive*). The proposal can be found in Letter from the board of RC 11 Nov. 1958, *Melbye Archive*

2. Create a purely national government centre that would handle programming and machine operations.
3. RC to operate machines and handle programming
4. National and local government and RC establish a centre together.
5. Tasks require licensing to tender.

To ensure local and national governments optimal influence over budgeting and work priorities they decided to reject options 3 and 5. Likewise, they rejected the purely national government option, as it would all too easily cause conflict with the proposed local government centre. They concluded that a combined national and local government centre with involvement of RC would be the best solution.

In the following period, there was uncertainty as to what the relationship with local government should be. During summer 1959, Kampmann apparently resolved the situation by offering to ensure finance of the proposed data processing centre. Local government could hardly refuse this offer and during the course of the following months, they negotiated and finalized the arrangement. These negotiations took place in the political sphere and as such, RC took no active part. Finally, Datacentralen (Data Centre – DC) was established in December 1959 and Olsen, much to the surprise of RC, was employed as director. Even more consternation occurred by the fact that a technical working group by DC decided to order an IBM 7070 machine to be delivered two years later. RC had invested considerable effort to collect detailed information on existing computers and projects under way, to find the best technical solution suitable for DC – but RC was not consulted.³¹

The idea behind the establishment of DC was twofold. One was to create a central EDP-institution, which would enable the government to proceed with the plans to create not only a PAYE tax system, but also providing government and administration with the necessary data-processing capabilities needed for the Welfare State. They also considered a centralized institution with a large-scale computer the most efficient,³² and furthermore should prevent the waste of resources, earlier identified by the reports regarding the use of punched-card machinery. This second goal was represented by §12 of the articles of DC which stipulated, that none of the

³¹ At that time, B.S. Petersen travelled the USA, collecting information on computers and peripherals (printers, memory etc.) which could be relevant for the planned new large scale computer for RC as well as for the 'state machine' as he phrased it. He was well aware of the different requirements for the two purposes. N.I.Bech kept him posted about the political developments in Denmark. Luckily these letters have survived. *B.S. Petersen archive*

³² The so-called Grosch' law – the bigger the computer the cheaper the costs for each operation. H. Grosch, "The Digital Computer as a Research Tool," in *Journal of the Optical Society of America* vol. 43, nr 4 pp. 306-310, 1953, p. 310.

interested parties (local and central authorities) could operate or purchase EDP-machines without first obtaining permission to do so by DC, but the result of the political negotiations was, that in practice nothing hindered the local authorities to do whatever they liked.³³ Also in relation to other state institutions (for example DSB – Danish State Railways) this paragraph was largely ineffective, except in one notable case – Regnecentralen and the introduction of computers in the universities.

In order to secure the function of RC its role in research, education and development and thereby establishing an independent expertise in the use of computers, RC created the so-called University Plan in co-operation with the three universities (Copenhagen, Aarhus and the Technical University, DTH). The universities agreed in providing buildings for RC, which on their part offered to provide GIER-machines, which universities could use free for at least eight hours a day. In addition to that, RC would place their research and development activities at the universities, and give them access to the best capacities in the computer area to be utilized in the training of the students. In addition to that, new methods and tools in areas like numerical analysis, statistics, and operational analysis could be further developed in close co-operation with university researchers.³⁴ This offer was of great advantage to the universities, given them access to a relatively advanced computer and new areas of scientific research. For RC, this would guarantee its survival, and be in accordance with the character of RC as an institution under the Academy of Technical Science – a non-profit organization that at the same time would promote the co-operation between science and industry, train the next generation of experts and solving problems for industry.

The financial plan was, that the government had to provide loan, that would be paid back over a couple of years by income generated by RC's commercial activities as a service bureau and development work for private and public customers. This would also give students the chance to learn

³³ This problem was addressed frequently in the following years. For instance the Board of DC's comment to the audit report 1963/1964, *Budgetdepartementet – Erik Ib Schmidts embedsarkiv Box 11*, 21.5.65

³⁴ This section is primarily based on the following archives: *ATV-archive* Box 216. *The Melbye-archive. Aarhus University Archive*, Op.cit. Box : Regnecentralen. 325/60 - NF 22. *Forvaltningsnævnets Sekretariat* op.cit. and *Tilsynsrådet* op.cit.

A good account on the discussions on the University-plan from Aarhus University's point of view can be found in Svend Bundgaard: *Hvordan EDB kom til Aarhus Universitet*. DAIMI, Aarhus 1978.

Minutes from meeting between RC og Aarhus University's committee on calculating machinery 8.6.1961. *Aarhus University archive*. Note on the establishment of a branch of RC at Aarhus University 23.6.1961. Op. Cit. More general see Chr. Gram, "Gier på læreanstalterne," in P. Sveistrup et. al. Op. cit. pp. 51-54

from real life problems, thus giving education and training for the new technology a practice-oriented approach.

They obtained political support by a verbal promise by then Prime Minister Kampmann, who was very eager to promote science and technology and saw the possibilities this plan gave in the efforts to create a modern industrial sector and a rational state.

However, just before parliament's financial committee was to approve the arrangement in the summer of 1962, DC stopped it cold pointing at the infamous paragraph 12. The problem was that the PAYE was delayed, and the newly formed DC already had invested considerable funds in buildings, personnel, and machinery. The board of DC argued, that the scientist should utilize these resources first.

The arguments from DC were understandable giving their conception of the emerging computer technology. Computers were primarily very large and very fast data processing equipment. Their main objective was to prevent waste of resources. To them it all was a question of using the EDP-capacity in the most effective manner, and the position held by RC and their allied scientist was soon seen as just another effort to cultivate own interests, much like every head of department in central administration insisted on having his own DP-department. DC was a big investment and was supposed to pay 3 million DKR lease to IBM that summer, without having any substantial income at that time. The project threatened to turn into a financial and political failure, and they could not allow that to happen.³⁵

The scientific milieu on the universities were the primarily supporters of RC. In their eyes, the plan was perfect, since the primary problem for the future was the lack of qualified computer personnel - and the plan exactly addressed that problem. In addition, the plan would boost research and training in various new fields like numerical analysis, operational analysis, electronics etc. The problems DC faced would only be temporary. Soon there would be plenty of work for DC and the biggest problem would be the lack of qualified personnel. Furthermore, the use of DC's equipment would not suit the needs of the universities, since direct access to computers and the combination of research, development and training was of outmost importance.

In this group's frame of mind, DC's resistance to the plan seemed irrational, and they suspected that the real reason for DC's attitude was something else than the official. Soon the suspicion rose, that IBM was behind all this.³⁶

³⁵ For details, references to archives etc. see P. Klüver op. cit 1999 pp. See also L. Heide op.cit. pp289-291.

³⁶ RC had actually had contacts with IBM on the possible involvement in producing GIER. But rumours that IBM had offered a large computer for free to DTH further nourished that

This situation prompted hectic activity especially in the Finance Ministry. The main actor was Erik I. Schmidt one of the most influential civil servants from the 1950s on. Also being a member of ATV's working group on management and business economics, he had good contacts to the scientific community and to the state administration. He was assisted by the before mentioned industrialist Haldør Topsøe, who also was very active as a member of the Atomic Energy Commission and the Danish Technical and Scientific Research Foundation. During the next 1½ years, they tried to work out a compromise. The available documents and notes, especially from E.I. Schmidt indicated that RC was willing to compromise. The application for a state loan was substantially reduced, RC promised not to compete with DC on administrative tasks for the state and so on. However, DC was very reluctant to give in. It was also a matter of principles. If RC were to continue with its plan, it would be difficult to refuse other state institutions desire to get their own computers.

In the meantime, RC's financial situation grew more and more desperate. Trusting that they would accept the University Plan, a department had opened in Aarhus, and the research and educational activities increased. There was only one way to go: Flee forward. So, contrary to the original intend, RC started a series production of GIER and stepped up its commercial activities by installing a large computer, CDC 1604 A, in Valby. All these investments made RC's financial situation even more precarious. It was like riding a tiger, hoping that Parliament eventually would grant RC its much-needed loan. It was finally granted on 16 December 1963. However, by then it was too late. On 13 January 1964, RC was reconstructed as a limited company. Its corporate culture would remain to have a distinct academic and non-formal character, and it would continue to carry out activities. That did not make any sense from a business point of view. Nevertheless, it was a commercial company, although a peculiar one, until its next collapse in 1972.

As for DC, RC was right. The need for EDP in state administration grew fast in the next years. DC reached a break-even point in 1964-65, and soon the demand exceeded DC's capacity. PAYE, VAT, and the Central Persons Register were only some of the largest tasks. However, the story was completely different regarding DC's role as the central governing and coordinating organ for the public use of computers. The next years DC had to fight several state institutions (Danish State Railways, Danish Statistical Bureau etc.) wish to get their own computers – with little success.

suspicion.. In 1964 IBM actually donated a 7090 to DTH, creating the North Europe University Computing Centre. Letters from N.I. Bech to B.S. Petersen 20 jan. 1960 and 9. March 1960, *B.S. Petersens Archive*. Letter from J.N. Gosselin, IBM, Paris 28.2.1962 to RC's Board, *Melbye Archive*. B. Rosengreen, ed., *NEUCC 1965-1975*, Lyngby 1975

As we have seen, the introduction of computer technology in Denmark follows Hans De Geer's model nicely. The awareness of the new technology actually came mostly through personal contacts on the technical-scientific level. The obtained new information systematically and gained experiences by constructing a machine and techniques are developed by practical experiences. However, this model also tends to underestimate the crucial importance of commercial companies, e.g. IBM, especially if one looks at established bureaucracies. Here there seems to be a more straight line of development, from various filing systems over punched card technology to computers. Nevertheless, as we have seen in the controversy between RC and DC, the latter line of development tends to support an interpretation of computer technology as more a less advanced punched card technology, as a tool for handling large amounts of data only. The line represented by RC supported a broader and more comprehensive view of computer technology. This would later develop to datalogy, as they coined "computer science" in Denmark, which was seen as a new way of analyzing systems and flows of data in general, providing new scientific tools that would prove their worth in planning and governing large systems like society as a whole.³⁷

Therefore, the new computer technology with its tools, practices, and theories seems to fit perfectly with the new social and political discourse contained in the idea of the interventionist welfare state. However, they would accept both ideas a few years later.

³⁷ P. Naur, *Datamaskinerne og samfundet*, Copenhagen 1967.