BUILDING 'ILMARINEN'S FINLAND'

Computer construction as a national project in the 1950s

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The Committee for Mathematical Machines (Matematiikkakonekomitea) was appointed in the spring of 1954, with the task of determining whether and how a 'mathematical machine', as electronic computers were then called, should be acquired for Finland. The Committee's work was regarded as one of the first large-scale scientific projects in post-war Finland. This pioneering position was probably why the Committee needed to be justified with good arguments. The Committee's decisions would express the more general standpoint(s) taken in Finland towards the postwar expansion of scientific and technical research and its consequences. The Committee quickly decided to obtain a computer, and furthermore to copy one from Göttingen in Western Germany.[1]

Tellingly, the vice-chairman of the Committee Erkki Laurila invoked the nation in 1954 by referring to an 'Ilmarinen's Finland' as something worth striving for. The blacksmith Ilmarinen plays an important role in the Finnish national epic, the *Kalevala* (ed. Elias Lönnroth 1835/1849), where the smith can also be seen to embody technological prowess. Professor Laurila urged to increase the technical capabilities and practical skills among the leaders of the country in order to make the Finns more independent and not only a nation of writers and wise men, 'the Finland of Väinämöinen', but also a technological nation.[2]

How did technology become a national project in Finland?

Since the 1990s, a number of social scientists have pointed to technology and national aspirations and identity as having something to do with the success enjoyed by Finland and Finnish companies in new technology markets. Already earlier, it had often been noted that following World War II technology was a 'national project' (kansallinen projekti) in Finland. This allegedly shared, underlying perception of the national importance of new technology has been used as an explanation of the Finnish successes related to high technology, for example the rise of the Nokia Corporation from the mid 1990s on. In the dissertation, rather than applying the notion of technology as a Finnish 'national project' as an explanation, I have made it the object of scrutiny, viewing the concept as a historical and cultural construction.

To examine what the Committee for Mathematical Machines meant for its participants, I ask the following questions: How was the Committee for Mathematical Machines justified, especially from the perspective of the national good, and what kind of motives did the actions of the Committee manifest? I focus in particular

on their motives in the computer field, in developing science and technology in society, and in imagining Finland anew.[3] In speaking of the Committee I include those associated with it, such as the builders of their computer, the ESKO.

The materials for the study consist of a multifaceted collection of sources from Finland, Sweden and Germany. Archival material, such as minutes of meetings, memoranda, lecture manuscripts, and in particular letters related to the work of the Committee, has been found in all three countries and has been extremely valuable. Published sources, such as magazine and newspaper articles, have also been used. In addition I have conducted seventeen interviews.[4]

Methodologically, I draw on the 'new' cultural history, in particular on microhistory approaches and the history of technology. In addition, the research is informed by the multi-disciplinary field of science and technology studies, for example the Social Construction of Technology approach. In the history of technology, nationalism has been examined as, for example, an influence on technological style (Thomas Hughes). Finnish historians of technology have also discussed nationalism and technology to some extent – although not as co-constructed cultural phenomena.

Drawing on the history and sociology of technology of recent decades, I regard technology, politics and culture as mutually constitutive. On the co-construction of technology and national identity, an important inspiration in my research has been the work of Gabrielle Hecht. In *The Radiance of France: Nuclear Power and National Identity after WW II*, published in 1998, she examines how the French, after their wartime humiliation, imagined a technological France and how they built the country's technological prowess in order to maintain the greatness of France. Like Hecht, in thinking about nationalism I follow the work of Benedict Anderson and his well-known thesis of nations as imagined (political) communities. This means that nations are not perceived as given social units but rather as communities whose coherence is imagined through political and cultural practices. This thesis is to my knowledge the first attempt to apply a similar approach to the history of computer technology.

The many backgrouds of the Committee

According to my findings, the Committee for Mathematical Machines (1954–1960) was preceded by earlier research on analogue computers and also by several attempts at arguing for the national benefit of technology. During the war, Finnish scientists working for the war effort in The National Airplane Factory tried to overcome Finnish technological dependence on Germany. These negative experiences of wartime technological dependence formed a significant ground for the discussion on the need to increase technological independence in the post-war period and the era of the Cold War. A key figure in early Finnish computing, and later in Finnish science policy, Erkki Laurila (1913–1998), had served in the National Airplane Factory. When he became Professor of Engineering Physics at the Helsinki University of Technology in 1946, he continued his pre-war studies on analogue machines.[5]

In Finland it was especially professor Laurila who combined technological and cultural work. Laurila participated in several organizations and groups, of which I have concentrated on one of the least known, the Finnish Cultural Foundation (Suomen Kulttuurirahasto), where Laurila was appointed to the executive committee in 1949. The foundation advanced Finnish culture,

from the arts and humanities to the economy and technology. This broad concept of culture was derived from the Finnish 'national philosopher' Johan Vilhelm Snellman (1806–1881), a Hegelian and a 'Fennoman' (Finnish-minded and advocate of the Finnish language rather than Swedish), who had urged the Finns to develop their country both spiritually and materially. For the members of the Foundation, cultural policy was a tool to strengthen the Finnish national identity; this included Finnish achievements in technology.

In 1954, Erkki Laurila submitted a proposal to the relatively new State Board for the Natural Sciences, to establish a committee to investigate the possibilities of having a 'mathematical machine' available in Finland. By this time, Laurila had the support of some national scientific authorities in mathematics, one of them being professor Pekka Myrberg, head of the board in question. After only a few weeks, the Committee for Mathematical Machines was appointed and could begin its work.

The Academician Rolf Nevanlinna (1895–1980), an internationally prominent mathematician, was appointed chairman of the Committee. He too had previously expressed an interest in the use of such new machines. As Laurila had done earlier in the Cultural Foundation and elsewhere, in the Committee for Mathematical Machines Laurila emphasized the need to build Finnish know-how in mathematical machines. He argued that even the Finns (who in general were used to importing technology) could benefit from technical research and inventions if these areas were properly encouraged and funded. For Nevanlinna, the most pressing and nationally important reason to acquire a computer for Finland was the need to keep up with developments by promoting mathematics and sciences. The Committee combined these motives by choosing to duplicate a G1a computer from Göttingen, Western Germany. The G1a was to be completed in Helsinki under a tight schedule (eighteen months or less), and the construction process would train some Finnish engineers as computer specialists.

The G1a/ESKO Computer

The Max-Planck-Institut für Physik had offered Rolf Nevanlinna a blueprint of their recently planned small scientific digital computer, the G1a, which the Committee could copy without charge in Finland. A German constructor, Wilhelm Hopmann (1924–2002), planned to build the G1a computer as a follow-up version to the successful G1 computer. Hopmann designed the G1a as an ambitious 'minimal machine'; a construction that would need only a minimal number of parts and would still be useful to scientists in various fields.[6] What the Finns, Nevanlinna and Laurila, did not know when opting to copy the G1a was that the blueprint was then still under development – and it would take much longer than they thought in 1954 to complete this complex minimal construction. In Helsinki, the main constructor of the ESKO was Tage Carlsson (1929–2008).

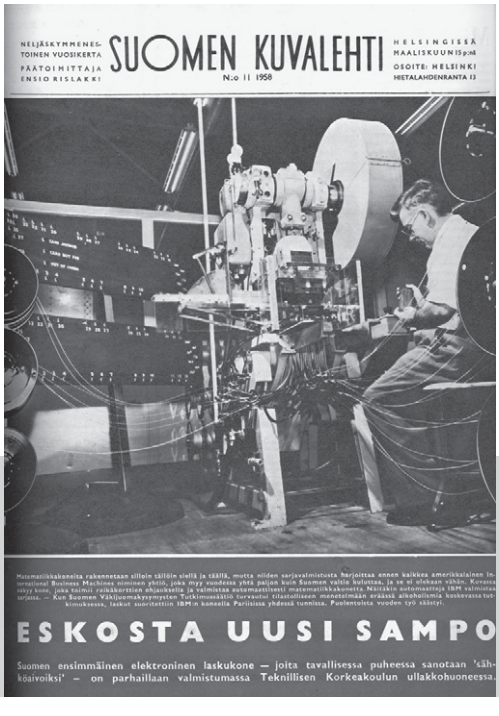
The G1a/ESKO had its program stored on paper tape; thus it was not a von Neumann type of computer, which has its programs stored in the memory and which would ultimately prevail. Despite this, the ESKO was expected to be adequate for instance for ballistic calculations for the Finnish defence forces, which had from the start been designated as the most urgent task for a Finnish computer. Other applications for the computer would be in the various areas of applied mathematics (astronomy, probability calculus, and strength theory) represented in the Committee.

Uncovering the Committee's Goal: A National Computing Center

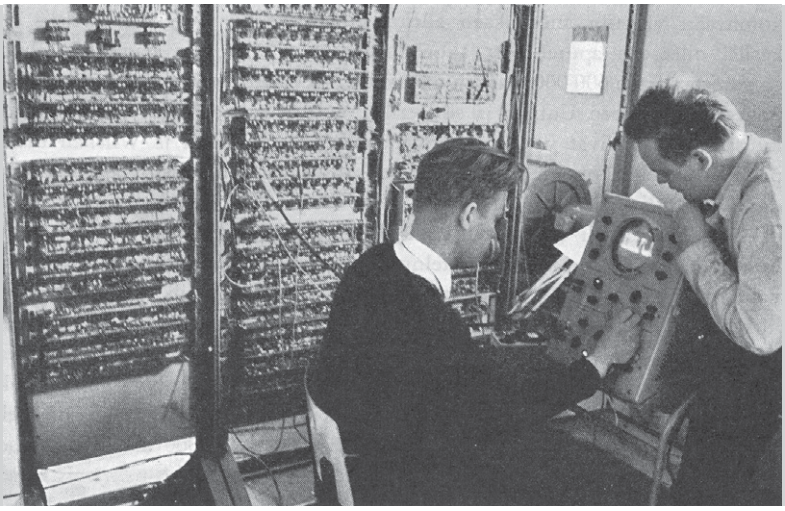
Despite the importance of obtaining a computer, I argue that right from the start the Committee intended not only to have a computer built but to create a national computing centre in Helsinki. This major attempt by the Committee has been virtually forgotten. The computing centre was of particular interest for professor Laurila. Already when the two engineers who were going to build the computer were studying computer technology in Göttingen during the winter of 1955, Laurila wrote a letter stating that he would like to appoint one of the grant recipients, Hans Andersin, as director of this future computer centre. This centralized usage of the expensive computer technology was at the time an internationally shared model. In early computerization in Finland, both international exchange and national arguments were present at the same time, and both played a crucial role.

As soon as the construction work started in Helsinki, the computer was publicized widely in the press. Interestingly, in public an associate of the Committee represented its computer as a Finnish one. The G1a computer was renamed in Finland as ESKO. This was an acronym derived from 'Electronic Serial Computer' (in Finnish spelling), as well as a popular Finnish male name at the time. Moreover, ESKO could be seen as referring to the popular comedy *Nummisuutarit* (1864) by the 'national writer' Aleksis Kivi (1834–1872), in which the young Esko was the central character. I interpret this naming and publicity as serving to signify the national importance of the new device. Additionally, I argue that by this naming of the computer the Committee aimed at constructing both technology and national identity.

Importantly, the Committee wanted publicity because they had a science policy plan of their own, which was linked to the idea of a national computing centre. In the projected computing centre, Finnish computer specialists could start serving a wide array of clients with the centre's new equipment. They could also train and employ more computer experts for the country. Through the computing centre the Committee aimed at improving the technological capacity and opportunities for military, scientific, and industrial research in Finland. From its work for clients the computing



The cover of Suomen Kuvalehti magazine in March 1958 promising the ESKO to become a new "Sampo", and depicting an IBM computer factory in the United States. Suomen Kuvalehti 11/1958.



Tage Carlsson, with Veikko Jormo to his right, testing the ESKO computer in the late 1950s. These two men formed the technical working group for the Committee for mathematical machines. They build the ESKO in Helsinki during 1955–1959. For the source of the picture, see Paju 2008a, 430.

centre would derive funds for further scientific research and development work – in computers and probably more generally.

Tellingly of their motives, to support its centre the Committee planned to establish a "commercial and non-profit association". This partly idealistic association could include state units as well as firms – such as industrial companies and probably computer suppliers, such as IBM in Finland. In principle all organizations were welcomed. I interpret this plan as having been permeated by national idealism, uniting different interests for the greater good of the future technological Finnish nation. Moreover, I argue that this should be understood as a policy separate from official government: especially in the case of Laurila, but shared by many other scientists and engineers. It was a policy based on nationalism and technocracy (relying on expert knowledge and explicitly non-political). The master plan for a computing centre (circa 1955) can be regarded as a scientific and technological policy on the part of scientists and engineers prior to (co-ordinated) state involvement in such matters in Finland.[7]

First, to implement the plan, a member of the Committee, Dr Kari Karhunen, proposed to the annual meeting of the Punched Card Association in 1955 a joint undertaking to create a computing centre for Finland. This centre could then acquire a large general purpose electronic computer that would be available for all to use. Second, the Committee's agenda was promoted – along with the know-how of the nascent field in general – by giving the first seminars on computers in Finland during the academic year 1955–1956.

Teaching the prospective clients and users of the computer centre

Of the two simultaneous seminars, the one led by Hans Andersin at the Helsinki University of Technology was divided into two parts. I interpret this division as reflecting the organization of a computing centre that Andersin and Tage Carlsson had learned on their visit to a computing centre in Stock-

holm (1954). In the autumn, the audience consisted of the managers of punched card departments and other potential customers of the foreseen computing centre. The teaching examined the basic and broad principles of modern computing, along with all the latest international trends. In the spring of 1956, on the other hand, Andersin went into the details of computer technology and discussed the practicalities of for example repairing shut-downs and computer errors – in a particular computer, the ESKO. In other words, he was training specialists for the customers to hire. This is because the computer in a computing centre of a 'small country' would be operated by the customer's own specialists, not ones employed by the centre. It can be concluded that the Committee and particularly Hans Andersin were preparing for their computing centre to start work. Simultaneously, to follow the ideas of Mika Pantzar,[8] via publicity and teaching the members of the Committee were constructing a need both for computers and for a new policy of promoting science and technology in general.

Things, however, did not proceed as planned. The potential customers of the computing centre, such as the 'punched card men', were evidently not particularly interested in the plans of the Committee. This can be deduced from the fact that in parallel with the seminar in the spring of 1956, Hans Andersin and Tage Carlsson developed a plan of their own. Andersin wrote to his German colleague Wilhelm Hopmann that he and Carlsson were about to start a Scandinavian company to import computers, which later would also offer computer service. They represented Konrad Zuse's products in Finland. Konrad Zuse planned to manufacture G1a computers, or did so until the prototype project in Göttingen was first delayed in 1956.[9] This setback also made the two Finns quickly abandon their business plans.

It is worth noting that people from IBM Finland had also participated in the seminar taught by Andersin. Actually one of the three IBM employees there seems to have been the same person who in 1956 was promoted to chief executive officer of IBM Finland. In the autumn of the same year Andersin, who was one of the two most prominent associates of the Committee, was hired to work for IBM. Judging from the composition of the seminar, the Committee evidently was not excluding IBM Finland from its possible partners. The company management, however, probably saw the situation more competitively, which could be one reason they recruited Andersin. It may also be relevant here that IBM Finland, nationally the leading punched card machine vendor, was mostly run by Swedish-speaking Finns, who in general had since the end of the nineteenth century emphasized shaping Finland through international exchange. Andersin too belonged to this influential Swedish-speaking minority. In contrast, the Committee chairmen were Finnish-speaking and in favour of strengthening Finnish independence in technology as well.

In 1956 the Committee members spoke of automation on several occasions and invited foreign experts to present their ideas on topics relevant to the Committee. The Committee members usually did not mention the ESKO, still under construction, or the plan for a computing centre, but I argue that the motives of the Committee went unchanged in 1956–1957. In addition, Erkki Laurila became increasingly involved in the development of nuclear energy research in Finland. In this area, and others, the imagining and construction of 'Ilmarinen's Finland' proceeded and was strengthened. The general positive attitude towards what was perceived as modern technology enhanced the effectiveness of public campaigns and various other measures.

IBM starts the computing race in Finland

In late 1957, a major punched card user, the state-owned Post-Savings Bank, ordered an IBM 650 computer. At the time the ESKO was thought to be almost finished as well. What followed was a race between the two parties: who would inaugurate the first computer in Finland? As part of this competition, the ESKO was made public when it was close to being finished in spring 1958. In the popular national weekly magazine *Suomen Kuvalehti*, the (second) cover presented the ESKO as a new 'Sampo', referring again to the Kalevala. The Sampo is a magical source of wealth, forged by the famous and technically skilled smith Ilmarinen – and worth fighting for. Tellingly, this line on the magazine cover was accompanied with a picture of an IBM factory manufacturing computers. Inside the magazine, the reporter criticized importing computers when a domestic computer, the ESKO, was also available.[10] Thus the magazine and journalists crafted and/or were used to craft an imagined technological Finland.

The G1a and the ESKO, however, faced another delay in the summer of 1958, and IBM won the competition. The first computer operated in Finland was the IBM 650, called 'Ensi', or 'First', installed in the state-owned bank. IBM had made a special effort and cut delivery time to less than a year. Within the Committee, this haste uncovered previously hidden tensions between the engineers and the mathematicians. These partly conflicting motives surfaced in the question of where to locate the ESKO when it was finished. To avoid conflict, the University of Helsinki, the choice of chairman Nevanlinna, was agreed on as the future location.

After this competition, the national Committee quickly accepted defeat. Remarkably, even before the race for the first computer had begun, the Committee had asked the bank management for permission to use the new IBM computer for public services. The bank gave the national Committee access to the computer for the purpose of various scientific and technical calculations, including some for the military command centre, as in a computer centre. In this case, the two strategies of importing technology and improving domestic capacity and know-how worked together for the national benefit.

The Committee's legacy prepares the way for the future Nokia

In 1959, the mathematician Olli Varho of the Committee thus temporarily succeeded in running a computer centre using the IBM computer at a state-owned bank. Probably thanks to the popularity of this activity, at the beginning of the 1960s three computing centres were started in Helsinki. The ESKO, finalized in 1959–1960, was placed in a new computing centre at the University of Helsinki, where it was used until 1962. However, it was unreliable in operation, and experts regarded a computer using programs on paper tape as outdated. Both IBM and the Finnish Cable Works (Suomen Kaapelitehdas) received expert personnel from the national Committee, which ended its work in 1960. The Finnish Cable Works was the high-tech predecessor of the Nokia Corporation.

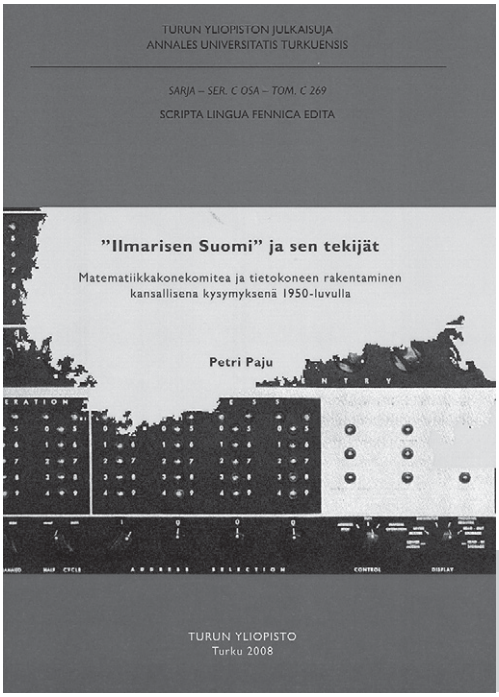
Summing up: the greatest benefit from the project of the national Committee for Mathematical Machines went to the two competing companies, IBM and the Finnish Cable Works, and to individuals on or associated with the Committee. Most notably, the Finnish Cable Works started a computing centre similar to that planned by the Committee since the mid-1950s. In the spirit of the Committee with regard to the

development of national capabilities, the company also established its own research and development department, using revenues generated by the computing centre. This computing centre and the R&D department later evolved into the Electronics Department of the Nokia Corporation.[11] All in all, through the Committee members and associates working in companies and universities, the educational impact of the Committee would continue in principle to benefit all Finnish computer users for many years to come.

'Ilmarinen's Finland' as an argument for a technological Finland in the making

I use the term 'Ilmarinen's Finland' to argue that technology did not just become a 'national project' in post-war Finland, but was explicitly made so. Various national arguments played a role in re-imagining the country, including reference to earlier emblems of national construction via literature, such as metaphors from the Kalevala, and other achievements of spiritual (intellectual) national culture. I do not mean, however, that some permanent condition of 'Ilmarinen's Finland' was achieved in the 1950s. Rather, I suggest that an important change began to take effect in the ways Finns thought about themselves and about their capabilities regarding researching and producing new technologies. This change had been in the making in both the cultural arena and in that of economics and technology probably since the 1920s, soon after Finland's independence.

The planners of 'Ilmarinen's Finland', such as Erkki Laurila, were part of a larger group of pro-technology people, for whom 'technological nationalism', as I call it, became an important motive to develop their organizations and the country. In practice, there was no unanimity in the 'national project' of either the Committee or the larger group. Conversely, the promotion of technology seemed not to be a united national project but a variety of such projects. For Laurila, for instance, 'Ilmarinen's Finland' meant first and foremost greater national technological independence, whereas others would rely primarily on importing the new technology. The interaction of these different groups, and the long-term changes that occurred in technological nationalist thinking, are some of the questions that call for further research.[12]



The cover of the author's doctoral dissertation.

Conclusion

New evidence of the postwar Finnish cultural policy shows that the argument of the national importance of technology has a longer history than is at present recognized. This is at least partly in contrast to recent studies, which often see Finnish science policy as starting in the 1960s. These studies misunderstand and underestimate the science policy initiatives taken prior to state-dominated science policy.[13] After examining the activities of professor Laurila and his colleagues at the Finnish Cultural Foundation, I suggest that in the 1950s some of them intentionally tried to shape the way Finns thought about technology and their technological prowess. As in France, this mutual construction of technology and national identity may have reshaped both. I suggest that these arguments have played a substantial role in the long-term processes of the development of technology in and with society and culture. These results may be relevant in studying the cultural foundations of the present-day Finnish system of innovation, and the values inherent in it.

Somewhat surprisingly, I find the major significance of the Committee for Mathematical Machines, in addition to its beneficial educational impact, to be that it encountered difficulties and needed to change plans. The significance of these difficulties was that they forced individuals like Erkki Laurila to rethink their strategy for achieving a technological Finland. The Committee provided them with important lessons in developing Finnish culture and society. Towards the end of the 1950s, Laurila in particular abandoned his national idealism for a more realistic concept of how to get the Finns to collaborate. Consequently, in the so-called Linkomies Committee (1958–1963), where Laurila participated in shaping the future of Finnish science policy, he agreed to support the state as a powerful new actor to take over science policy; this was now considered the best way to ensure a coherent process of national development. In the private sector, the Finnish Cable Works became Laurila's favoured strong actor in building national know-how in electronics. These findings strongly suggest that the essential intellectual foundations for a future technological nation had been, to a great extent, established by 1960, even though the national construction of Finland of high technology was only just beginning.

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[1] This article is based on an English summary for the author's Ph.D. dissertation "Building 'Ilmarinen's Finland': The Committee for Mathematical Machines and computer construction as a national project in the 1950s" (Original title (in Finnish): "Ilmarisen Suomi" ja sen tekijät. Matematiikkakonekomitea ja tietokoneen rakentaminen kansallisena kysymyksenä 1950-luvulla.) The dissertation was accepted at the University of Turku in the summer of 2008. See Paju 2008a, 522–530, and Paju 2008b. For book reviews etc. see my home page at http://users.utu.fi/petpaju/

[2] Väinämöinen is a wise man or shaman in the *Kalevala*; and later a symbol of the "spiritual side of culture" as opposed to Ilmarinen's materiality. Laurila, Erkki, "Väinämöinen ja Ilmarinen," *Uusi Kuvalehti* (Ancient Heroes, from the national epic Kalevala, in Finnish), vol. 3, no. 35, 1954, p. 6. The original *Kalevala*, edited by Elias Lönnrot, was published in two parts, in 1835 and in 1849.

[3] However, in this summary article, other results than the ones concerning the details and complexities of the national construction are perhaps overemphasized because of limited space available.

[4] For the sources in English and a developed treatment of the Finns' international contacts, see Paju 2008b.

[5] Cf. Paju 2000. For Laurila's publications on analogue machines, see Paju 2008b.

[6] See Hopmann 2000.

[7] Cf. for instance Lemola 2002.

[8] See for instance Pantzar 2003.

[9] See also Petzold 2003.

[10] Mäkeläinen, Osmo, "ESKOsta uusi Sampo" (ESKO—The New Sampo, in Finnish), *Suomen Kuvalehti*, no. 11, 1958.

[11] See Paju 2008a, ps. 440–444, 451–455. Cf. Häikiö 2001.

[12] Since the dissertation, I have examined one of the later national projects in the 1970s and the results confirm that similar national ideas and ideals continued to influence the same people and this field in general. See Paju 2009. For a comparative study regarding the development of computing and the cold war in Czechoslovakia and Finland, see Paju and Durnová 2010.

[13] Cf. Lemola 2002.

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