SISU: The Swedish Institute for Systems Development

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Abstract. The research institute SISU aimed at supporting the public sector as well as Sweden's business and industry in introducing modern methods and tools when developing information systems within their organizations. SISU was founded in 1984 by support from twenty-four companies and organizations and the Swedish Board for Technical Development (STU). In its peak period around 1993, SISU had forty employees and a turnover of 35 million Swedish crowns. The institute carried out a large number of national as well collaborative, EU-supported projects. One result of the projects was the forming of innovative Swedish companies and development of IT-products. SISU was discontinued in the year 2000 primarily due to lack of financial support.

Keywords: ESPRIT, information systems, methodology, research, software tools, technology transfer

1 Background

The Swedish Institute for Systems Development (SISU) was a research institute aimed at supporting the public sector as well as business and industry in introducing modern methods and tools when designing and developing information systems within their organizations. This narrative presents reflections on why SISU was established, how it was financed, what its main achievements were, and why it was discontinued. In order to have a better understanding of the story, we will first present a brief survey of the computer hardware situation as well as of the systems development method and tool situation in Sweden in the early 1980s.

To know the number of people aged 16–74 who used the internet[1] at home was a question of no relevance in the early 1980s. The internet simply did not exist. Instead Sweden was populated with a fairly large number of mainframe computers, at least when it comes to their physical size. Companies or public organizations owned the computers. My guess is there were between two thousand and three thousand of them installed in Sweden in the early 1980s. From a performance point of view, these computers could not even compete with a laptop of 2010. They had a processor speed of about 0.5 MIPS, a memory of 64–128 kilobytes and a secondary magnetic disk

[1] For some, not accounted for, reason SCB's (The Swedish Bureau of Census) statistics about computer use in Sweden ends with persons aged 74. The author of this paper is 75.

memory of 25–50 Megabytes. Magnetic Tape units were frequently used. Many online, terminal based applications started to appear. The terminals used had simple, text-oriented displays. Graphics oriented terminals were extremely rare. Personal computers started to appear but except for a few Apple Macintosh personal computers, the operating systems were not windows-oriented.

IBM dominated having a 70 to 75 percent share of the market. In many cases the 360 computer (IBM 360/30, 360/40, 360/50) had replaced the IBM 7090, 7070 and 1401-type of computers. Other vendors such as Digital Equipment Corporation (DEC), Datasaab, ICL, Univac, CDC, and others competed on the remaining 25 to 30 percent share of the Swedish market. Minicomputers such as DEC's PDP-11 and VAX computers were not unusual in technical applications. They also introduced the UNIX operating system and made possible local mail use between users in a company. Later this developed into a more global email system where computers were calling each other in order to transfer mail. In the early 1980s, an email address consisted of a chain of computer names the mail had to pass in order to be delivered to its final destination. The data transfer speed was very modest: about 1,200 bits per second. As said above, the world wide web did not exist at this time, but IBM had its own worldwide network connecting IBM installations. Another well-known net was the ARPA-net connecting many US universities. Compatibility between computers did not exist, except for within a particular vendors' product line. For this reason, transferring of software from one vendor's hardware to another vendor's hardware was a non-trivial task, even when the software was written in a high-level language.

Computers, or rather computer centers, were normally run by the "data processing (DP) department" or "division" of the company. Practically all company information systems were produced "in house" by a company's own system analysts and programmers or by consultants. Standard software packages were rare. This situation gave the DP departments a strong position in companies and organizations. The manager of the DP department was often also member of the top managing group of the company. Information was considered valuable and expensive.

The market of "methods for computer use" or "methods for information systems development" during the 1970s in Sweden was dominated by data processing system departments of large companies (e.g. Ericsson, Telia, ABB, SCA, Volvo, etc.) and by a few large consulting companies such as Programator, ENEA, Data Logic, and Statskonsult. Most of them had their own, semi-structured, "home-made" method handbook. Vendor companies, most notably by IBM, demonstrated considerable method influence also. The user organization "Riksdataförbundet" and its service organization Servi-Data also carried out a number of projects aimed at description and comparative analysis of practical methods for systems development. Practically all these methods were practical and informal, some even having their roots in punched card oriented approaches.

In summary, method use in organizations was primitive. No generally accepted method for system development existed. System development tools started to appear but were hardly used. Lack of interactivity and graphical workstations made the use hard. Graphical representation of system flow and data diagrams was still quite primitive.

2 What Could Academics Offer?

Academic education and research in systems development had just begun. The ISAC and the CADIS[2] research groups at the Royal Institute of Technology and Stockholm University (KTH & SU), influenced by the works of Börje Langefors[3], were among the first in Sweden to work on theoretical aspects of methods for systems development. The ISAC group had already established a research institute called "Institute V" supported by a number of organizations in practice. ISAC was concerned manly with the early system development stages. Otherwise, contacts between the academic world and the field of practice were relatively sparse. We in the CADIS group and later in SYSLAB[4] were primarily concerned with implementation aspects of information systems design, including design of databases. We felt it also necessary to expose our ideas and results to the field of practice, in order to improve the quality of systems design and development work in Sweden.

What did we have to offer besides our enthusiasm and optimism? We had a fairly good grasp of the method situation concerning models of systems and information (data). We were also working on prototypes for implementation of CASE tools as well as for tools to develop object oriented office information systems.

By doing research on system development, we were of the opinion that much could be improved in practice. Standardization and improvement of methods, use of computer-based tools for system design and development were needed as well as a strict and less "local, home-made flavor" inspired evaluation and use of methods. In addition, in method education, much could be improved and new and modern methods could be taught. We also felt that the methods and prototypes we were working on had the potential to be "inherited" by companies and then developed further into marketable products, methods as well as software.

Therefore, in 1983 we started our work to establish a research institute forming a bridge between the academic world and practice.

3 Founding of SISU

The SISU institute was founded in 1984 as a natural consequence of two research efforts – the research groups CADIS and SYSLAB as well as of our collaboration with some companies in business and industry. Instrumental in the process of forming SISU was SYSLAB's industrial advisory group[5] headed by Rune Brandinger, then the CEO of Valand Insurance Company. In 1983–84, researchers from the department, including the author, together with the advisory group, contacted a large number of

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[2] CADIS (Computer Aided Design of Information Systems) a research group at KTH & SU between1969 and1979, mainly sponsored by STU (Swedish Board for Technical Development).

[3] Börje Langefors became Sweden's first professor in "Administrative Data Processing" at KTH and SU in 1966.

[4] SYSLAB is the SYStems development LABoratory at the department, established in 1980.

[5] Members of the group were Krister Gustavsson, Statskontoret, Gunnar Holmdahl, ASEA Information Systems, Göran Kling, Volvo-Data, Sten Martin, Swedish Defence, Per Olof Persson, Riksdataförbundet, Sven-Erik Wallin, Esselte Datacenter, and Kurt Wedin, Vattenfall.

Swedish organizations in order to obtain financial support for forming a research foundation. Considerable support was obtained. A "supporting user and partner organization" called "Intressentföreningen för SVensk Informationssystemutveckling" (ISVI)[6] was established. SISU's research plans for the first three years, 1985–87, were worked out and documented in a "Framework Program" (ramprogram). All members of ISVI guaranteed to support SISU's research according to the Framework Program.

STU[7] and twenty-one supporting organizations and companies initially financed SISU. The Swedish government decided, in the autumn of 1984, to establish the operation of the industry research institute SISU starting January 1, 1985. The 1985 budget of SISU was about 8 million SEK. A number of researchers[8] moved from SYSLAB to SISU during 1985.

4 Initial Activities

The main goal of SISU was to act as a bridge between the worlds of practice and academia. Initially, SISU's main areas of activity were: 1) The Information Center (information dissemination, education), 2) Management of Information and Data Resources, 3) Methods and Tools for Problem-oriented Systems Development, and 4) Interactive Systems – Office Information Systems. The idea was to take some results of CADIS and SYSLAB and develop them into "prototype products" which could be demonstrated in practice. Two of these were OPAL (later renamed to AVANCE) and RAMATIC.

OPAL was a prototype system for distributed object management. This system would be used to build advanced and interactive office information systems. The architecture of OPAL was strongly object-oriented. The language PAL was developed for defining office applications [1]. The basic idea of OPAL was to decrease drastically the effort needed to implement advanced office applications.

RAMATIC was a meta-CASE tool, i.e. a tool to build CASE-tools for different methods and description techniques. In this way, we would be able to generate CASE tools for our supporting organizations, which all were using more or less different models and techniques for describing systems. RAMATIC was later used for building system-modeling tools in a number of Swedish organizations as well as in several international projects financed by the European Union's Framework programs.

Another legacy from SYSLAB that further developed at SISU was the conceptual information modeling knowledge and tradition. It later contributed to developing strong participatory business and enterprise modeling approaches as well as computer supported modeling tools within SISU.

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[6] ISVI members in 1984 were: ASEA, Datalogic, DBK, ENEA, Ericsson, Försvarsstaben, Götabanken, IBM, Infologics, Kommundata, Programator, SAAB-SCANIA, SE-banken, Skandia, Statskonsult, Statskontoret, Televerket, Valand, Vattenfall, Volvo-Data and Volvo-PV.

[7] The Swedish Board for Technical Development.

[8] Matts Ahlsén, Lars Bergman, Peder Brandt, Stefan Britts, Janis Bubenko, Jr., Roland Dahl, Tord Dahl, Mats-Roger Gustavsson, Christer Hultén, Lars-Åke Johansson, Eva Lindencrona, Stefan Paulsson, Lars Söderlund, Håkan Torbjär, and Benkt Wangler. SISU's first secretary was Marianne Sindler.

All SISU's initial software prototype building was made on SUN-1 Workstations under SUN Unix and programmed in C. Ericsson had donated five SUN-1 workstations to SISU. These computers were considered quite powerful at this time.

5 National Projects

In its "peak period" (1990–93) SISU had an annual turnover of about 35 million Swedish crowns and about forty employees. The institute generated and carried out a large number of national collaborative projects, where the supporting organizations from ISVI took an active part. Hence, many persons from the supporting organizations received advanced training. One such project was TRIAD that generated and documented a vast amount of knowledge in business modeling in organizations. TRIAD also produced a by-product: a very easy to use, simple Macintosh based graphical modeling tool called Business Modeler. Regretfully, Business Modeler was not exploited outside the TRIAD project. Other examples of national projects are HYBRIS and Effective IT.

HYBRIS developed a hypertext-based tool that allows inexperienced computer users to navigate in and retrieve information from large corporate databases at a conceptual level. The information contained in the databases is represented in a graphical conceptual model – the information map. Queries are formulated by pointing and clicking directly in the information map.

Effective IT was a fairly large, two-year, umbrella project that ran from 1993 to 1995. It was initiated by a preliminary study project ordered by Sweden's ministry of industry and business and by NUTEK (a successor of STU). The aim of Effective IT was to investigate the possibility to define a national research program for improved and more effective use of IT in Swedish business and industry.

6 Collaborative European Projects

SISU understood early the scientific, technological, and the economic importance of joining European Union's ESPRIT program. Work on forming of consortia and on preparing project proposals started in 1987. SISU managed to be accepted as partner in a number of EU-projects such as KIWIS (2424), TEMPORA (2469), Nature (6353), F^3 (6353), INTUITIVE (6593), LYNX (6816), and several more. In the mid-1990s, about half of SISU's staff was engaged in EU-supported projects. During the period from late 1980s until the year 2000, SISU participated in more than twelve EU-supported projects, These projects pursued a number of advanced topics such as federated knowledge bases, temporal-deductive information system modeling, multimedia object management, accessing information in heterogeneous corporate databases, advanced techniques in requirements engineering, computer supported collaborative work, and several more topic areas. This collaborative work gave later openings for forming spin-off companies such as CNet, Projectplace, and ALKIT.

7 Main Contributions

Which were the main contributions of SISU to Sweden's professional society? The most concrete effects are formation of new pioneering IT-companies and through them, the transfer of innovative method and software tool knowledge and technology to usable products. IT-companies formed include NeoTech, CNet, Projectplace, and ALKIT. The next concrete contribution is more than 15 academic degrees (Licentiate or PhD degrees) awarded to SISU employees. SISU played an active role in supporting such studies, financially as well as scientifically. Other contributions include spreading of the "Culture of Conceptual Modeling for Business and Information Systems Development" to many Swedish organizations[9]. One of the names for this activity is "Enterprise Modeling" which now has grown into an international academic as well as a practical discipline. This discipline is now being exposed in conferences related to requirements engineering, information systems engineering, enterprise resource planning, and to practice of enterprise modeling (see for instance PoEM [2]). Another important contribution of SISU is bringing Swedish enterprises to participate in EU's research projects in particular in the ESPRIT program (European Strategic Program for Research and development in Information Technologies). Overall, SISU's activities on the European research arena gave Sweden improved recognition in international research in IT. Above all, it gave many young Swedish researchers and IT-engineers a taste and feeling for working on the European market. SISU was also instrumental in starting up the well reputed international CAiSE (Conference on Advanced Information Systems Engineering) conference series now celebrating its twenty-second annual conference [3].

SISU continued its operations until 2000, during the last two years as part of a research company Framkom. The foundation had a concluding passive period 2000–04. SISU's managing directors were Janis Bubenko, Jr. (1985–92), Thomas Falk (1992–94), and Eva Lindencrona (1995–98) and Mikael von Otter (1998–2000).

8 Why was SISU Discontinued?

The reason for the discontinuance of SISU is a crucial question and difficult to answer. As expected, there were several contributing causes. One of them is economic disturbances and recession in Sweden. In the beginning of the 1990s, the interest rate climbed to 500 percent. The so-called "IT-bubblan" started in latter part of that decade. Companies found it more and more difficult to justify expenses on supporting IT research, in particular in companies classified as IT users rather than IT developers such as the Ericsson company. However, Ericsson had problems as well, as we remember. Telia (Swedish Telecom) also had difficulties as had most IT-consulting companies. Ericsson and Telia both were supporting SISU to more than 50 percent of SISU's total budget. Both these companies discontinued their support in

[9] As an example, the modelling approach has been used by the National Board of Health and Welfare in order to describe and display Sweden's "national information structure" (http://ni.socialstyrelsen.se).

the late 1990s. This discontinuation contributed strongly to the demise of SISU. Participation in EU-projects in mid-1990s was considerable. It generated some money, but all EU-support was spent on producing project deliverables. The above reasons obviously made it very hard for SISU's management to obtain sufficient financing to run SISU as an independent research organization and not as a consulting company.

Nevertheless, my feeling now, more than fifteen years after the peak period of SISU, still focuses on another reason that is perhaps quite essential for the decline of the institute. This reason is that to apply research results in practice necessitates an undertaking requiring high-competence user organizations, considerable time, and human resources. SISU's supporting organizations were in the 1980s and 1990s perhaps not ready to make such long-term commitments. In this sense, our initial expectations about our supporting organizations and their capability for technology transfer and take-up were far too optimistic. What could be the reason for this situation? In my opinion, it is the relatively low degree of research and development orientation of the education underlying employees of most of our supporting organizations. The academic education in Sweden in computer and systems science and in the neighboring topic "Informatik" has, since its start in the end of 1970s, had a very low fraction of education in the mathematical and engineering sciences. This has fostered, I believe, an attitude among our supporters that excellence in systems development is something that can be bought, by acquiring advanced products, instead of developing skills and competence of the organization itself.

On the other hand, we have to be a bit critical about ourselves as well. We began in 1985 by building two extremely complex prototypes. Resources required to implement them were perhaps five to ten times larger than we had available, but we did not know it then. Consequently, OPAL/AVANCE was never completed and we could not find any Swedish company willing to invest the resources needed for its completion. RAMATIC was practically used in a few projects. In addition, here we failed to find a Swedish company willing to carry the complex work further towards a product. We had better luck with some prototypes in the 1990s, but this was because the prototypes were constructed as products by the staff who originally designed them at SISU.

We had better luck with the exploitation of methods and knowledge for business and enterprise modeling. Knowledge from this field was disseminated to many organizations and hundreds of professionals.

9 Concluding Remarks

SISU existed during a fifteen-year period. The technical conditions in the beginning of the period and at its end were vastly different. In 1985, computing was mainly done on incompatible mainframe computers. Few workstations or PCs existed. In the year 2000, the internet was in full swing and computing in Sweden was largely done by compatible personal computers. The market had grown to more than a million of PCs, but they did not require the kind of complex software SISU had been developing. The most characteristic thing was the speed with which everything evolved. Such a

quickly evolving world of telecommunications and computing calls for different research priorities and research transfer initiatives compared to what existed in 1985. An intriguing question might be, is there a market for a research institute with a similar direction as SISU? That is, does a market exist for the dissemination of information system development methods and tools that existing today? Personally, I think there is a true need for that, but the task to convince business and industry to understand that need and to put any money in such a venture is most likely quite discouraging.

One may find more information about SISU at http://www.sisuportal.se/ (developed by CNeT) which contains more than 250 documents produced during the 1985–2000 period. A description of SISU's knowledge and technology transfer activities can be found in [4]. The forty-year history of the Department for Computer and Systems Science [5] includes reports about CADIS and SYSLAB and in that way forms the background to the establishment of SISU.

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