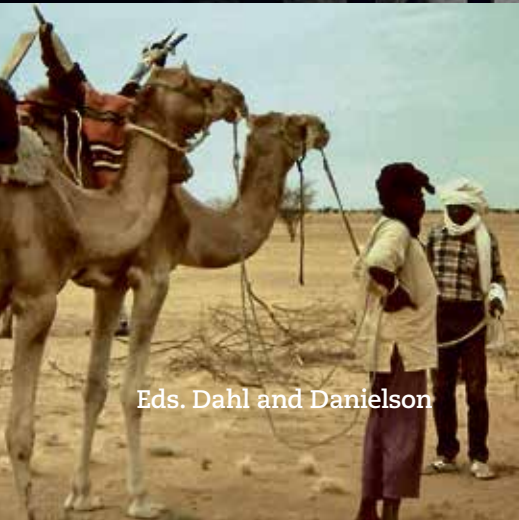# Faculty of Social Sciences
Stockholm University
1964 – 2014

Eds. Dahl and Danielson

Stockholm
University

Department of Computer and Systems Sciences

Anita Kollerbaur and Love Ekenberg

THE DEPARTMENT of Computer and Systems Sciences at Stockholm University (DSV) has been a pioneer in promoting research and education that combine aspects of computer science with regard to the use of IT in diverse areas, starting with its administrative use in organisations. DSV has continued to work on the basic ideas from the 1960s of which Sweden's first professor of informatics, Börje Langefors, was the father. Later social sciences and humanities were added to the aspects covered by the Department and, most recently, arts sciences. DSV is the largest department at the University, and the largest IT department in Sweden. In 2006, DSV celebrated its 40th anniversary. Its history was then documented in the book (Kollerbaur et al. 2006).

Looking back, it is difficult to maintain a meta-perspective, since so much has happened over the years. Here we will therefore concentrate on some of the most important events and developments within this tremendous evolution in education and research – an evolution that has had a substantial impact on Swedish society.

During the last forty years or so, we have seen systematic shifts in the use of computers. Needless to say, this development has also extensively affected DSV's research and education. From having been used only in professional settings in very limited numbers and regarded as unique artefacts that were powerful, but primarily passive tools, the role of computers has changed dramatically. Today, the focus is on large groups of human communication and collaboration, assisted by extensive networks of fine-grained computational elements. These elements penetrate all human activities and are used by virtually everyone. They are also rapidly becoming more and more embedded in, and not distinguishable from, other artefacts, and are typically more active in the collaborative processes – in contrast to being the passive tools of yesterday.

DSV was initially located in Building F of Södra huset in Frescati. (Photo: Mats Danielson)

Over the years, DSV has been an important actor in the field, constantly trying to keep up and running in front of this historical paradigm shift. It has frequently been a dramatic but rewarding journey, having had a strong impact on the development of information systems in a societal setting.

The birth of an academic discipline in the information age

In the beginning of the 1960s, it became clear at a political level that the expansive development of computing would motivate increasing activities on several educational and research levels.

On April 3, 1963, the Swedish Higher Education Authority appointed a committee, chaired by Gunnar Hävermark, to investigate the need for activities in a new academic discipline, 'Administrative Data Processing', and to suggest a process for introducing it at Swedish universities. The committee[1] produced a report entitled *Akademisk utbildning i administrativ databehandling* on November 25, 1964. It recommended three chairs to be created, starting in 1965, at the universities of Stockholm, Gothenburg and Lund. The report also presented course outlines for the first three semesters of academic studies, corresponding to what is now 90 academic credit points. It was understood that studies

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1   Other members of the committee were Olle Dopping (secretary), Carl-Erik Fröberg, Curt Kihlstedt, Björn Tel and Christina Österberg.

in administrative data processing should be combined with studies in other disciplines, such as business administration, statistics or mathematics, in order to obtain a Bachelor of Science degree (180 credit points in total).

The Ministry of Education decided to give the new discipline the name '*Informationsbehandling, särskilt den administrativa databehandlingens metodik*' (Information processing specialising in methods for administrative data processing)[2]. This corresponded reasonably well at that time to the discipline called 'Information Systems' in some other countries such as the US.

From July 1, 1965, the new discipline was established at the Royal Institute of Technology (KTH) in Stockholm. The subject was taught not only to students of engineering but also to students at Stockholm University. The actual department was formed in 1966. Börje Langefors was appointed acting professor in 1965 and full professor in 1967.

The academic discipline of computer and systems sciences covers knowledge and skills necessary to analyse, design, develop and maintain information systems in small and large organisations. According to Langefors, problems and methods related to information systems belonged to the infological or to the datalogical realm. In the infological realm, focus was placed on the analysis of organisations including such aspects as objectives, processes, and information requirements. Here, the aim was to study an information system from an organisational viewpoint. This includes the analysis of information modelling and supply, as well as usability issues and human-computer interaction. In the datalogical realm, focus was placed on efficient storage, processing and communication of data. Particular topics were data modelling, database management, data manipulation languages, and query languages. The datalogical realm, in Langefors' view, also included CASE technology, method engineering, and software engineering. Today, the subject is not explicitly grouped into these two areas, but the perspectives are still valid. Langefors also claimed that Information Systems is a discipline with few fixed borders. Conceptions and views are continuously changing. This means that new types of problems, infological as well as datalogical, constantly emerge, while other kinds of problems become less relevant as time passes. Many of these changes are triggered by advances in computer programming as well as computer and communication technology or by changing information demands.

Growth of the organisation

Many of the more specific areas of competence, where DSV has contributed with pioneering ideas like systems development, information

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2   Twenty years later, in 1987, the name of the department was changed to 'Computer and Systems Sciences', or in Swedish '*Data- och systemvetenskap*'. In this chapter, 'DSV' will be used from now on also for the initial period.

modelling, object-oriented programming, human-computer interaction, artificial intelligence, Internet technology, decision support systems and information security were evidently not envisioned in earlier times. This is not least the case with applications such as computer-based education, multi-modal communication and computer conferencing systems.

The dynamic character of our subject has also affected the organisational structure of DSV. For over 40 years, DSV was a joint department of KTH and Stockholm University, but since 2010 it belongs solely to Stockholm University. Before that, all activities at the joint department organisationally belonged either to KTH (from 2009 within the School of Information and Communication Technology), or to Stockholm University (within the Faculty of Social Sciences). Both universities had graduate and undergraduate courses, research activities and external contacts within the Department. All courses and programmes, every research project, and every position in the Department were formally established at either Stockholm University or KTH. However, almost all staff were engaged in activities at both universities. Even after the split, there is cooperation in many areas of research and education.

An academic discipline matures through the progress in research and education carried out by its scholars. Since the start, DSV has developed from being a department with a few

enthusiastic optimists to, in 2013, a large number of full-time staff. All of them have contributed to DSV's development, in different roles as teachers and researchers, as administrators and as teaching assistants.[3]

The same main organisation was kept, until 1995, when research was reorganised into three research laboratories. A third substantial change in the organisation was made in 2003, when the activities began to be conducted within the framework of units. The activities include research, postgraduate education, and furthermore, education and training, commissioned education, and interaction with the community at large. To implement the new organisation, the responsibilities, functions and roles for different categories of personnel were all carefully specified.[4]

Besides the pioneering Börje Langefors, there are other names that merit special mention. The initial group of teachers and researchers who had a special role in the creation of DSV were: Janis Bubenko Jr, Peter Bagge, Rune Engman, Olle Källhammar, Nils Lindecrantz, Mats Lundeberg, Tomas Ohlin and Kjell Samuelsson, as well as DSV´s head of

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3   Obviously we cannot present details on who led and participated in the many research projects, or who contributed to the internal development and administration. However, those who are not mentioned explicitly in this article should know that they are all remembered, and that we are planning to make as much historical material as possible available on the DSV website.

4   The units are described into more detail later in the chapter.

The Electrum building in Kista, home of the Department between the years 1990 and 2001. (Photo: Mats Danielson)

department, Tord Dahl, who successfully led the Department during the long period from 1979 to 2002. From 2002 to 2008, the department head was Anita Kollerbaur and from 2008 until the present, Professor Love Ekenberg.

Empirical summary

From 1990 to 2013, DSV has grown substantially. In 1990, the total turnover was 25 MSEK compared to 238 MSEK in 2013. In the same period, the number of professors has increased from 2 to 15 and the number of full-time equivalent students from 750 to almost 2,000.

A number of political reforms pertaining to higher education have influenced DSV like all other university departments. We want to mention particularly the importance for the development of research and graduate education of the promotion reform for professors, which dramatically increased their number.

The growing department has moved physically four times and, in 2014, it will move a fifth time to the newly built NOD building in Kista. The first premises were hosted in the core part of the KTH campus, to be followed by premises within the new SU campus at Frescati from 1971 until 1990. Since then, DSV has

been located in Kista, first in the Electrum building and then, from 2001, in the Forum building – both situated along Isafjordsgatan. Of course, to reside in one of the top five IT clusters in the world has been advantageous to DSV, enabling numerous collaborations with industry and public society.

The computational environment

IT access for students, teachers and researchers was considered as a specialised service of an exclusive nature in the 1960s. Decisions about the general organisation for, and provision of, such services were concentrated to a central public authority. The Department had to accept this principle. The central authority even invented a special currency, 'computing coins', which were handed out to departments on a yearly basis. These virtual coins could be converted into computing resources, hours and minutes of runtime on various, mostly central, computing facilities.

Naturally, DSV worked hard to make available as large amounts of computing coins as possible. When access was insufficient, alternatives were analysed. The Department was one of the first to try decentralised computing, when technical development made such resources possible and ultimately available.

Timesharing systems were introduced at the beginning of the 1970s. End-user access to computing resources meant a tremendous increase in systems availability. This was long before the PC, although the terminals at the time were somewhat awkward to handle practically, and were naturally completely 'unintelligent'.

Entirely through its own efforts, the Department turned to the computing industry, and was ultimately given the chance to try out a small local HP (Hewlett-Packard) system with the agreement that usage experiences would be collected and made available to HP. The policy at DSV of providing modern, up-to-date IT environments for students and staff was introduced with the HP system. The system initially supported eight teletype terminals. A specialised terminal room, available around the clock, was set up at the Department. This meant a fantastic increase in access possibilities for students. No longer did they have to hand piles of punch cards to a centralised reception and, hopefully, receive the results the morning after. Instead, compilations and test runs could be made on the spot. Access time was counted in minutes instead of hours. Interactive programming was introduced using the BASIC language.

Over the years, users have naturally seen several shifts in DSV's computing environment. In the mid-1970s, the first personal computers appeared. At that time, the general opinion at DSV was that personal computers could not be a complete computing alternative for education and research at university level. However,

In the period 2001-2014, DSV was situated in the Forum building in Kista. (Photo: Mats Danielson)

a few researchers started using personal computers at an early date and developed a system called GLAS (Graphic Low-cost Advanced System) for use in research of computer-based learning in the schools from 1980. Each GLAS computer had more computing capacity than the HP system, as well as better functionality and technical performance than the first IBM PC. With the first Macintosh system 1984, attitudes started to change.

In 1990, DSV had an environment with 30 PCs with MS-DOS, 24 Macintosh systems and 32 'dumb' terminals connected to the central computer systems. There was naturally an increased use of personal computers during the 1990s, both for staff and for students. Since 2001, when DSV moved to the Forum building, the workstation environment has been substituted with advanced personal computers.

The facilities for students in the new NOD building are very modern, with the latest versions of wireless networks in all areas and access to wired networks in most locations. They will, for instance, have a large number of rooms for IT supported group work, as well as access to four specially equipped laboratories for studies in multimedia, security, computer games and interactions. Computer rooms will still be available, offering the latest versions of personal computers.

The administrative tools at the Department have also undergone substantial change following the technical development. DSV has been a pioneer in the use of timesharing systems, personal computers, use of computer conferencing systems and web technology. As early as the 1970s, Professor Jacob Palme was working on communication between people by means of computers, which led to the KOM system. KOM was introduced in the early 1980s at DSV.

DSV internally developed the administrative system Daisy, now supporting most of the main work processes and parts of internal information for both students and employees. Daisy has been in use since 2000. Since 2007, an increasing number of distance courses have been developed. These courses utilise the platform Ilearn, developed by DSV and based on the freeware program Moodle. Ilearn supports all types of courses for distance education, blended learning, and campus courses. We have adapted the platform based on our research findings in the area of 'Designs for Learning'. We have also developed the system SciPro for elaborated thesis support.

Undergraduate education

Undergraduate education was historically the dominant activity at DSV, as a result of the need for educated people within industry, academia and society in general. This has changed over the years. Currently, DSV has a good balance between research and higher education, on one hand, and undergraduate education on the other.

The first course block was offered in 1966, with approximately 70 students enrolled at Stockholm University. In 2005, undergraduate education had grown to approximately 1600 student places per year. DSV's undergraduate education has grown significantly since 2000. This is interesting, since so many activities in the ICT sector decreased in both quantity and impact at the turn of century

The content of DSV's education mirrors the latest findings in research as well as the current needs in trade and industry, particularly within areas where DSV has special competence. Single subject courses have been offered since the beginning. Many of these had joint student groups from the University and KTH and were often given as sets of courses in the same academic area, such as Security Informatics or Artificial Intelligence.

The first DSV programme was established in 1977 as a consequence of a reform of Swedish higher education, which initiated the design of a national curriculum for a three-year Applied Systems Science programme. Stockholm University was one of nine universities commissioned to implement a local adaptation of the education plan (*utbildningsplan*). Initially, the programme was designed to meet the requirements of the labour market, a major theme of the 1977 reform. However, during the last two

years of the programme, DSV gave the programme a strong research connection. In 1981, the Department started to argue for a one-year extension of the programme. The commitment to a national programme was abandoned in 1988, and in 1993, to DSV's great satisfaction, the Department was allowed to replace the three-year programme by a four-year Computer and Systems Sciences programme.

The area continued to change rapidly. In 2000, an extensive plan for redesigning the undergraduate education was outlined. Experience had shown that students preferred longer educational programmes. As part of this initiative, DSV established and engaged itself in four new programmes, combining IT with other subject areas. The first two were the four-year 'ICT and Communication Sciences' programme that started in 2002, followed by the three-year 'Multimedia Education and Technology' programme (in collaboration with the Department of Education at Stockholm University) from 2004. The 'Market Communication and ICT' programme (MarkIT) was established together with the GI/IHR (later the Department of Advertising and PR) from 2006, as well as the two-year master programme ICT for Development. By this strategy, DSV managed to avoid a decrease in undergraduate education, which would otherwise have taken place. The volume of applicants was no longer nine students per course place as it was at beginning of the 1990s.

Programmes combining IT with other subject areas have since become one of the strengths of DSV. Four of the eleven bachelor's programmes we offer in 2014 are given in cooperation with other departments at the University. Six master's programmes will start in 2014, including a distance-based one. The Master in Health Informatics is given as a joint programme together with *Karolinska Institutet*. The latter programme leads to a joint degree from both universities. All master's programmes are taught in English.

DSV started early with distance education. During 2014 we will give 12 such courses and two complete master's programmes: one in project management and one in ICT for development.

To increase the quality of theses at both basic and advanced levels, a unique process with supporting tools was developed and introduced. During the process, the students are given increased and systematic support with special emphasis on methodological aspects. The process is clear, and the students are systematically taken through this. Firstly, the examination criteria have been clarified, so that all those engaged in the process have the same idea of what is required. A reviewer is allocated early in the thesis work, who gives the supervisors and students feedback and support throughout the process. The reviewers must at least be docents. They form a group, who collaborate among themselves. This means that a

core of experienced people provides support for the large number of tutors and students involved in graduate work. This increases the quality assurance of all theses. The reviewers are also mentors for less experienced tutors. For all theses, the main examiner is a full professor giving the final grade to be awarded based on written documentation from the supervisors and reviewers, as well as a personal assessment of the thesis.

For supporting this process, DSV developed SciPro, an IT based administrative system, which has been in use since 2011. It includes both functionality for the whole process, from the development of topics to grading, and serves as a container for information for the student. It has an FAQ function as well as discussion forums. SciPro furthermore contains examples of excellent thesis work. The results of the new process, to increase the quality of DSV theses at basic and advanced levels, are very positive.

The programmes and courses at SU have been successful in attracting female students. The percentage of women varies. On average, DSV has had figures between 31 % and 48%, with a peak in 1999, and with large differences between the programmes. In bachelor programmes in 2013, the enrolment varied between 13% females in the Computer Science programme, and 65% in the Marketing and IT programme.

The good relations and cooperation between the Department and students should be mentioned. As required by the University, students are organised in a departmental student committee (Ämnesrådet, ÄR). In addition, students at DSV formed the students' association DISK in February, 1990. Since 2008, this is an independent union at the University. At DSV, students are consulted early in all planning processes, which is of great value to the Department. The Student Counselling Committee includes representatives from ÄR and DISK. From DSV, these discussions include the head of department, the director of studies, student counsellors and responsible administrators.

Graduate education

Graduate education started in the late 1960s at DSV. It has passed a number of stages and has been coupled with changes, particularly during the 1970s and the 1980s. The study programmes for DSV's graduate programme were initially specified solely for a doctorate and a licentiate in Computer and Systems Sciences, either at KTH or SU. In the year 2000, a study plan for the research area 'Man-Machine Interaction' was added, making it easier for candidates with backgrounds in humanities, cognitive sciences, medicine and communication sciences to enter a PhD programme at DSV. This programme was generalised to become the area of 'Information Society' in 2013.

At the end of the 1970s, 67 students were enrolled as PhD or licentiate candidates. 18 of them were registered at KTH and 49 at Stockholm University. By the end of the 1980s, the financial side had improved in connection with increased external sources, but funding remained an issue. However, increased external funding during recent years has improved the situation considerably, though the limited faculty funding for PhD students is still a problem.

Different models of organising PhD studies have been tested over the years. A research education committee, consisting of all supervisors, was established for a period in order to stimulate and improve the whole graduate programme and to link the PhD students' research closer to research at the laboratories. A PhD programme study director was appointed in 1995 and, in 2006, the programme was coordinated by a steering group and a group of senior researchers.

In addition to 'regular PhD students' being admitted to the programme, DSV has commitments with other universities and companies, in both Sweden and internationally, whose teachers, through grants for PhD studies, pursue their education with DSV support. DSV also has a number of SIDA funded PhD students[5]. In addition, there are several industrial PhD candidates whose companies fund their studies.

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5 SIDA PhD candidates pursue their PhD programme on a sandwich basis, meaning they spend half the time at DSV and the other half at their respective home country universities.

Staircase in the NOD building, leading up to the student reception area. (Photo: Mats Danielson)

Women now constitute a growing share of the PhD graduates. During the six years 2000–2005, 25% of all DSV PhD degrees and 22% of all DSV Licentiate degrees were achieved by women. In 2013, 25% of PhD degrees were achieved by women.

Research

Being a young department in a new scientific area, the Department had no research traditions to fall back on in the 1960s and 1970s.

After some years, research groups nevertheless started to emerge:

- CADIS ('Computer-Aided Design of Information Systems') in the datalogical realm was initiated in 1969 and led by Janis Bubenko.
- ISAC ('Information Systems and Analysis of Change') performed research in the infological realm during the period 1970–1980, initiated and led by Mats Lundeberg.
- PRINCESS ('PRoject for Interactive Computer-based Education SystemS') performed research on computers and education, and was initiated in 1973, led by Anita Kollerbaur.
- Research on videoconferencing was started by Kjell Samuelsson in the middle of the 1970s, leading to the experimental system InformatiCom.
- Research in the area of 'Programming Methodology' started in 1976, initiated by Sten-Åke Tärnlund.

The main financing for these activities was external via the Swedish National Board for Technical Development (STU), with which the Department had an exceptionally productive cooperation during the 1970s, and via the Swedish National Board of Education (*Skolöverstyrelsen*, SÖ).

Two research centres were established between 1980 and 1988, within the framework programme for research in Software and Information Systems funded by STU. CADIS became SYSLAB, with one location in Stockholm and one in Gothenburg, and the PRINCESS work was included in the centre CLEA (Computer-based LEArning environments). DSV also funded several large projects from the STU program in 1987–92.

In 1995, the number of projects and researchers had grown. To improve coordination and to further stimulate the research, three laboratories were created: SECLab (Laboratory for Security Informatics), K2 Lab (Laboratory for Knowledge and Communication) and SYSlab, Laboratory for Information Systems and Software Development.

Since then, the research at DSV has grown enormously. It is now in broad terms focused on the design and development of information systems to provide functioning solutions for the problems of today and tomorrow. This includes methods for the analysis of complex systems, interactions between people and IT systems and security management. We like to think that DSV's research mainly concerns important, real-life problems. This might be disaster management on a large scale, support for efficient meeting management or lifelong learning. We also create tools that are adapted to human language and that are used, for example, to make finding and summarising information from the Internet easier. This

research is primarily occupied with people's lives, work, educational activities and leisure pursuits. We want to understand and influence how technology impacts and changes our daily lives. Obviously, this includes the application of information technology in our professional lives, but also includes the mobile environment, playing and games, human health and different user groups, such as children and computer gamers.

The research at DSV is genuinely cross-disciplinary. It often spans several subject areas and incorporates perspectives and methods from other fields such as psychology, linguistics, philosophy, social sciences, statistics and mathematics. Our research also contributes to these fields through methods and technologies for seeking new knowledge. Research at DSV is often interdisciplinary, for instance in information systems relating to economics and law, or within human-computer interaction relating to psychology, education, linguistics and ethnography. In software development there are close connections to logic, statistics, applied mathematics, communication, industrial design, e-government, designs for learning and arts.

DSV was reorganised into units in 2003 to enable more structure regarding its research and educational activities. These units have responsibility for research, as well as graduate and undergraduate education, in their respective areas. At present, DSV contains four units:

- 'Act in Communication with Technology' (ACT), containing researchers working in the areas of Human-Computer Interaction, Social Computing and Mobile Computing Technologies. In particular, the research focuses on location-based experiences (the LX Lab), digital game design and experiences, and technologies for artistic experiences. These topics describe research themes in the unit, but each researcher focuses on more specific problems such as investigating how artistic performances can be supported through mobile technology, and how digital games can be designed to facilitate player immersion. ACT is led by Docent Louise Barkhuus.

- 'Information Systems' (IS) conducts research into education technology and management of information systems. An information system is an IT-based system that stores, processes and presents information in order to support the work and communication within and between organisations. The research includes disciplines such as database technology, business modelling, process management, requirements management, IT management, business systems, systems methodology, systems integration, service-oriented architecture and project management. IS is led by Docent Åsa Smedberg.

- 'Interaction, Design and Learning' (IDEAL) conducts projects, research and education in IT for learning, flexible learning, simulation

learning and assessment, human-machine interaction and communication and learning systems. IDEAL is led by Gunnar Wettergren.

- 'Systems Analysis and Security' (SAS) studies complex and dynamic systems that describe and define the world and society as well as decision-making under incomplete knowledge, presence of uncertainty and time constraints as well as other analytical systems issues. This is also reflected in the wide range of problems being addressed and solved, such as policy decision-making at local, national and international levels, including the impact on the environment or the insurance strategies of public and private property in case of natural calamities, public health issues and strategic business decisions. The diversity of the area draws on many disciplines such as mathematics, statistics, philosophy, psychology and economics. The spectrum of key activities covers subjects such as decision and risk analysis, data mining and simulation of complex systems. SAS is led by Professor Oliver Popov.

Influences and external impact

Computer and systems sciences is an academic subject that is today taught at more than 20 universities and university colleges in Sweden, originating from the DSV. It is represented by departments having many different names such as Computer and Systems Sciences, Informatics,

Economic Information Systems, and Business Information Systems.

DSV has been a fundamental source of academic knowledge, measured in the number of professors in the Nordic countries that have had their origins at DSV. The number of visiting international scholars and researchers at DSV is impressive, and a large number of scientific publications have been produced, including the PhD dissertations. In the year 2013, researchers at DSV published 143 refereed conference contributions, 82 journal articles, 26 book chapters and 4 books.

DSV has taken initiatives to arranging or leading national as well as international scientific conferences, and active participation in professional organizations such as IFIP, ACM and IEEE. There are also a large number of collaborations with companies and the public sector, contacts with national organizations and public authorities, and with international scientific networks and expert groups.

DSV is very actively involved in EU supported collaborative research and development projects. DSV has also stimulated several Swedish companies to increase their participation in EU projects, and has also been instrumental in SIDA supported projects aiming at supporting and promoting ICT in developing countries.

Many of the activities at DSV have reached far outside the Department. The DSV impact on education in Swedish schools has been fruit-

Entry hall of the NOD building from where most facilities can be accessed. (Photo: Mats Danielson)

ful. This includes impact from many educational research projects and useful cooperation with school administrations. Early prototypes of new applications have often proved to be useful for much longer periods than expected. Most important of all, one should note the substantial knowledge that students with DSV degrees have carried into practice in Swedish industry and the public sector. A number of spin-off companies originate from DSV. Persons from DSV have initiated research insti-

tutes such as SISU and *Institut V*, as well as many private companies in the ICT area, including ENEA, Infocon, NeoTech, CNet, *Projektplatsen*, Compumine, Preference, and more.

DSV has had its own application of the theories and the software developed by the research group on decision support systems for procurement since 2011. The tool makes it possible to formulate and evaluate criteria with higher quality than with the methodology usually applied.

DSV has also responded to many requests to take part in public policy connected types of analysis of proposals and effects from education and research in the 'information society'. This concept was only vaguely defined in the 1970s and 1980s. DSV's involvement in public committees and commissions on industrial, social and legal information matters has been strong, especially when one considers that many of the reforms for expansion of higher education and research were born here. Many analytic reports with roots in the Department have been formulated, which have described the expansion of education and research in the information society. In fact, it can be claimed that analysts with close connections to the Department took an active part in the very creation of the concept 'information society'. Many organizational, structural, economic, social, and legal issues have been analysed leading to the development of important social applications of considerable value for subsequent university educational development.

Current research centres
Spider Centre
Spider – 'The Swedish Program for Information and Communication Technology in Developing Regions' – supports developing countries in harnessing the benefits of ICT for development and poverty alleviation. In practical terms, it means promotion of and support for relevant 'Information and Communication Technology for Development' (ICT4D) efforts at partner institutions and organisations in developing countries, and the establishment of networks of collaboration in Sweden and abroad.

Spider supports development of ICT infrastructure, human capacity and relevant ICT content. The centre also promotes information management, communication and interaction, in addition to networking and awareness raising. Major areas for intervention are access, e-education, e-health and e-governance, including human rights aspects. The centre is a collaboration between DSV and national donor agency Sida (the Swedish International Development Cooperation Agency). The centre started 2004 and is presently managed by Kerstin Borglin.

Mobile Life
Mobile Life Centre was formed in 2006 at the initiative of Stockholm University. The focus of the centre includes research on consumer-oriented mobile and ubiquitous services spanning all areas from entertainment and socialisation to work and society. The centre joins forces with local research organisations such as SICS and the Interactive Institute. It has major partners from the IT and telecom industry, including Ericsson Research, TeliaSonera, Sony Ericsson, Nokia and Microsoft Research. Part-

nerships in the public sector, including the City of Stockholm and Kista Science City, secure societal relevance, and collaboration with Stockholm Innovation and Growth (STING) ensures that results are integrated into the innovation system. At the centre, this academic, industrial and public partnership is able to work jointly on strategically important projects that can provide sustainable growth. The centre is government funded by VINNOVA on a 10-year grant, 2007–2017. Mobile Life is led by Professor Kristina Höök.

E-govLab

E-govLab is our youngest centre, established in April 2014 and described in the section on profile areas.

Digital Art Centre

Digital Art Centre (DAC) is a project initiated in 2010 and is a physical arena where research and innovation in technology, media and art created in and around Kista gain visibility. By opening a new interface between technology companies and creative industries, cross-fertilisation occurs between the IT industry, working models, new research, and art, and thereby DAC leads to new ways to think innovatively.

DAC is also a launch pad in a long-term effort to create a fully-fledged digital experience centre in Kista. Key players in DAC are Stockholm University, Atrium Ljungberg, City of Stockholm, the Interactive Institute, Swedish ICT, Library Stockholm and Kista Science City. DAC is placed under E-govLab and the artistic director of DAC is Ingvar Sjöberg.

Centre in Arts and Technology in Society

On March 19, 2013 an agreement was signed between DSV, the Royal Institute of Arts and the Royal College of Music in Stockholm. The partners will collaborate within CATS – Centre in Arts and Technology in Society. The partners contribute their respective expertise in artistic expression and technology. The idea is to interact with the rest of society in collaborative projects, work for broadened recruitment to artistic educational programmes in Stockholm and to create educational programmes at master's and PhD levels.

For joint operations, there is a steering committee to which each party appoints one member. The steering committee lays down a business plan and a budget, appoints the director and makes decisions on other common issues. The artistic director of CATS is Rebecca Forsberg.

Profile areas in research 2014

The main focus of research at DSV can be roughly sorted under four areas in which we have a leading position and conduct highly acclaimed research.

- Arts and Technology for Society – RATS
- E-government
- ICT for Development, ICT4D
- Design for Learning, DEL

Arts and technology for society – RATS
Our programme in RATS addresses design and development of cultural, artistic and entertainment experiences, facilitated through novel technologies. By centring on artistic events rooted within society, the programme adds value to broader aspects of local and global culture within Stockholm and beyond the local community. Through ubiquitous computing technologies such as sensors and fibre networks, we develop new artistic events in collaboration with local and global partners for the benefit of both research and the broader population.

One of the core values within the RATS programme is local participation, which is based on the notion that there exists a close relation between quality of life, culture, social participation and democracy. Our research therefore aims to include participation by society members from the initial design of technology-mediated events, to the fruition of such experiences and their evaluations. One of the projects in RATS is the RATS Theatre having had productions at, among other places, Sweden's National Theatre (*Dramaten*). The theatre works with cutting-edge research and new technologies lifting productions out of the theatre auditorium and working in new ways: in the public domain, on web platforms and through mobile phones. RATS Theatre works in close cooperation with actors, artistic colleges, universities, institutions, theatres, museums, businesses and schools, both nationally and internationally.

E-government
The term e-government or e-governance is primarily used to refer to the usage of IT to improve administrative or policy efficiency. We aim at producing other effects that would lead to increased transparency and accountability of government processes, improve trust reflecting on the relationship between government and citizens, and help build new spaces for citizens to participate in their overall development.

Obviously, information and communication technologies are key enablers in the modernisation and democratisation of the public sector and of society as a whole. Over the years, the main focus has shifted from automation and rationalisation of manual processes in the public sector to the interactions between governments at different levels, on the one hand, and citizens and enterprises on the other. This has brought citizens and enterprises better public services with eServices as a key development in this area influencing all parties involved in public decision-making through eParticipation and eDemocracy.

The driving force behind this is the development of societal ecosystems that recognise and respect, as a fundamental right, the unhindered access to information and the right to take part in decision-making processes. We promote a model of society that ensures and safeguards that the means of access are provided and distributed equally across all sectors of society and to all citizens, irrespective of their sex, class, creed, religion, ethnicity or origin.

E-govLab has several national and international projects, and a national demonstration and test environment for Public Innovation have been set up with the aim of increasing the availability of practical solutions for eGovernance. We believe that by reducing the costs for testing eServices and systems, and increasing the dissemination of solutions for eGovernance and complementing existing laboratories for eGovernance, the E-govLab Test Bed will lead to new services, enhanced collaborations and well-informed citizens who will engage at an earlier stage of policy-making. The test bed is funded by Vinnova. The test bed will also be a natural link to major international initiatives such as Mindlab, Fraunhofer Fokus and Europe's large-scale pilots (LSP).

ICT for development (ICT4D)
Research in ICT4D involves the study of ICT in the context of developing countries and is designed to handle the difficulties and problems as

defined by the target group. ICT4D is a growing multidisciplinary field with many practical uses. Field studies in developing countries generate knowledge on how ICT can be used for development and poverty reduction. ICT can, for instance, improve livelihoods, increase access to education, improve health care, enhance participatory democracy and combat corruption.

Using participatory action research, IT products, services and models are developed, tested and evaluated in order to improve livelihoods, increase access to education, improve health care, enhance participatory democracy and combat corruption. DSV is engaged in ICT4D projects in Asia, Africa and Latin America.

Several projects are funded by Sida, the Swedish International Development Cooperation Agency. Researchers and graduate students from partner countries are involved in many projects and our projects are coordinated with other stakeholders such as donors, NGOs and research centres.

We are presently working with a multitude of countries, including Afghanistan, Bangladesh, Botswana, Cambodia, Kosovo, Bolivia, Ethiopia, Liberia, Rwanda, Sierra Leone, Tanzania, Uganda and Zimbabwe.

Design for learning
At DSV, research on 'Design for Learning' has been conducted since the beginning of the 1970s, as previously described. The scope and

focus of interest have varied over the years, but taken together, the research conducted has formed a critical mass of competence at DSV in this research area. 'Design for Learning' has also been named as a candidate for selection as a leading research area at Stockholm University.

The fast development of contemporary technology and techniques is changing conditions for learning in profound ways. With the widespread use of technology, like lap top computers, smart phones, and tablet computers, in conjunction with high speed internet connections, learning has become ubiquitous. Indeed, the world of education is currently undergoing a second revolution where digital technologies are transforming how we think about schooling and learning.

In our work, we are focused on understanding how information and communication technologies can best be used to support learning, teaching, and competence development throughout life. We also design and develop innovative educational applications. Our approach is interdisciplinary. Our team focuses not only on technology but takes into account and also deals with behavioural, cultural and social contexts as equally important aspects. Our work is conducted in projects that are financed by a number of foundations both in Sweden and abroad and concerns mobile learning, social media and learning environments, as well as virtual cases for learning and assessment.

In order to emphasise the importance of flexible education, since 2010, DSV has been heavily involved in open education and other flexible learning models. This work has been the foundation for the design of our learning environment in NOD, which is described in the next section.

An academic environment for the future

In spring 2011, the University decided that DSV should move to the NOD building in Kista to work in more suitable premises. NOD was built by Atrium Ljungberg with the aim of creating a completely new type of venue for learning, research, business, and culture with a focus on innovation and creativity. The new premises will be inaugurated on October 2, 2014.

The vision for DSV in NOD is that "[…] the new premises shall encourage meetings, remote conferencing, but also real encounters between individuals. The premises will offer a welcoming, functional, and flexible atmosphere for DSV employees, students and visitors. The character must be clear, a place to remember, talk about and happily return to. The premises have been an important part of brand building for DSV and, together with the high level of education, of creating an even bigger attraction and desire to attend IRL: The environment should feel

The NOD building at night.
(Photo: Mats Danielson)

NOD, an exciting centre of academic and corporate activities in ICT situated in Kista, was inaugurated in October 2014. (Photo: Love Ekenberg)