Development Plan for KTH CSC
Years 2010 - 2012
School of Computer Science and Communication
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Activities

The School of Computer Science and Communication (KTH CSC) conducts undergraduate education, graduate education and research in Scientific Computing, Computer Science, Media Technology, Human-Computer Interaction, Speech Technology, Musical Acoustics and Language at KTH and Stockholm University. These will continue to be our main activities. In addition, the School hosts four research centers: the Center for Autonomous Systems (CAS), the Center for Sustainable Communication (CESC) and Center for Opera and Technology (COT) and PDC, which includes PDC-HPC, a national High Performance Computing Center.

Competency

CSC includes Sweden’s most outstanding research and teaching departments in the field of Information Technology. Our intention is to strengthen our position both nationally and internationally. The School conducts both basic research on a high international level and research of more immediate industrial relevance. This is evidenced in the cooperation between our researchers and those from many of the leading universities both in Europe and the USA, involving participation in numerous European joint projects and networks.

Our research leaders and even our most outstanding junior researchers have themselves created and become established in research areas that have attracted much attention. The teachers are highly qualified and rejuvenate their work through their own research. The above evaluations are supported by an assessment of all research at KTH carried out in 2008 under the name KTH Research Assessment. The Swedish National Agency for Higher Education (HSV), which recognised CSC as a Centres of Excellence in Higher Education 2009. They are also corroborated by the assessments conducted by research funding bodies such as the Swedish Research Council for Engineering Sciences (TFR), Research and Innovation for Sustainable Growth (Vinnova) and the Swedish Foundation for Strategic Research (SSF), mainly in connection with international evaluations of the Research Centers CAS, CESC and PDC. They are further confirmed by the success of teachers and researchers in securing major long-term research funding in the face of stiff competition from the European Research Council (ERC) and SSF.

“We are drowning in data but lack information.”
“...life quality, health and care of the elderly.”
“...computers for games and amusement that raises the quality of life for both young and old.”
“...effective systems for crisis management.”
“...support decision-making.”
“plug-and-play functionality”
Future analysis

During the last 10-15 years, the field of computer science has undergone a unique development. Computers have evolved from being primarily computing machines to becoming consumer technology with communication as an important area of application. Computer technology today is ubiquitous and found in virtually every kind of system. It is therefore necessary to evaluate a future analysis of the School’s main disciplines: Computer Science and Communication, based on an analysis of contemporary driving forces in these disciplines.

A number of factors have a large influence on future use of computers at the same time as there is even today a tendency toward information saturation: “We are drowning in data but lack information”. One important goal in the use of computer systems is to create life quality in the community, which is dominated by an excess of computer communication. We want access to the desired information without being distracted by irrelevant information. Since one of the computer’s central areas of use is facilitating communication, a crucial task will be to develop user-adapted systems for services, content and interaction.

During the coming decades, the industrialized world faces a drastic ageing of the population. The number of pensioners will rise by 50% and the number of people over 80 years of age will double. This means that the community must increase its focus on life quality, health and care of the elderly. Increasingly, people will want to remain in their own homes and play an active part in the community without being isolated, and ICT can provide part of the solution to the dilemma. This places new demands on communicative and interactive functions. These functions will also contribute to a more sustainable society by offering high-quality mediated services as a substitute for traveling and physical transport.

Another important aspect is the widespread and increasing use of computers for games and amusement that raises the quality of life for both young and old. Creating ever more sophisticated games programmes drives the development of better hard- and software, particularly in graphics and visualization, which significantly affects the industrial development.

Recent tsunami and tornado disasters and the deepwater oil spill on the Gulf Coast have highlighted the need for effective systems for crisis management. For a number of key functions in society, a multitude of information sources must be integrated effectively to support decision-making. Such information systems must maintain a high level of reliability and robustness even in the event of serious disturbances such as software attacks and external intrusions. The computer systems must also be scalable, allowing them to cope with increasing amounts of information and demand on services by “plug-and-play functionality”.

All of these external factors have a large influence on the design, construction, analysis and use of computer systems in interaction with people. It is important to consider these factors when the School is planning its development through such means as employment of staff and planning of curricula and individual courses.

The work at CSC can be grouped as follows:

• Computer Science – The basic sciences of Computer Science and Mathematics
• Scientific Computing – The basic sciences of Numerical Analysis and Mathematics
• Modeling and Analysis
• Communication, Interaction and Media
• Computer Perception and Robotics

These different areas clearly overlap with mathematics, computer science and numerical analysis as a common scientific basis. We believe the work should have a clear mathematical/computer science foundation, even for those areas with a more applied focus. In Communication and Interaction in particular, contributions from the social sciences and humanities are essential. The theoretical foundation is the basis that provides the work with long-term validity and that molds the students for their future achievements.
Human Communication

“The UoA on HumCom is overall very good. ….. Part of the UoA currently performs at a world-leading standard with the main part performing at an internationally high standard. Its single strongest aspect is the world-leading research group in Speech and Sound.”

The assessors stated, however, that a strategy was lacking for coordination of research between departments, not even within closely related fields in their respective UoA. For this reason, it was thought that CSC lost in strength and influence in KTH and internationally. It was felt, for example, that HumCom could fulfill an important specific function in KTH if it had a more elaborate strategy: “As user and user-to-system interaction has become pervasive, the UoA on Human Communications could have much broader impact in several KTH technical areas.”

The criticism of insufficient strategic coordination and common visions for research at CSC led to the initiation of three thematic platforms or School platforms, which are intended to tie together the work of the departments more tightly. The point of departure for discussion was that the thematic platforms should embrace research fields in which CSC has a strong scientific position. The departments’ areas of strength, formulated as a set of core competences, will then be

KTH International Research Assessment Exercise and Strategic Analysis

During 2008, KTH conducted a comprehensive assessment of its research under the name of Research Assessment Exercise (RAE). Research at CSC was divided into two Units of Assessment (UoA):

Computer Science, consisting of the departments Numerical Analysis (NA), Theoretical Computer Science, (TCS), Computer Vision and Robotics (CVAP), and Computational Biology (CB).

Human Communication (HumCom), consisting of the departments Human-Computer Interaction (MDI), Media Technology (MEDIA), and Speech, Music and Hearing (TMH) including the Language Unit.

The research received, without exception, very good reviews:

Computer Science

“The overall quality of research and visibility is excellent….. Part of the UoA performs a world-leading standard with the main part performing at an internationally high standard. The UoA has a number of first-class computer scientists, and some spectacular research breakthroughs have originated from this unit in recent years.”

Human Communication

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CSC Thematic Platforms

Computer Science

NA TCS CVAP CB

Human Communication

MDI MED TMH

Computational Life and Cognitive Sciences

Human Communication

Simulation-Visualization-Interactivity
During the period 2009 – 2012, the thematic platforms will develop independently through their inherent dynamics and be assessed at the end of the period and some of the faculty funding is being channeled to the platforms to provide an immediate opportunity for actual cooperation across the department boundaries. For the coming years, the platforms are expected to apply for project funding themselves in order to eke out their resources.

KTH’s framework for prioritizing research fields during the next four years.

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Thematic Platforms

Simulation-Visualization-Interaction - SimVisInt: Computational Human Modeling and Visualization

This trans-disciplinary research aims to build an advanced virtual human being. The project requires combination of core competences in simulation, visualization and interaction.

“**This trans-disciplinary research aims to build an advanced virtual human being. The project requires combination of core competences in simulation, visualization and interaction.**”

Particular emphasis is on human motion such as capturing and control, sensing such as vision, audio and haptics, and communication in the sense of speech and body language.

The platform naturally connects to the Simulation Technology B.Sc. programme, the Visualization and Scientific Computing M.Sc. programmes, and the KTH strategic platforms: Technology in Medicine and Health, and Information and Communications Technology. In particular, the platform maps very well onto the KTH strategic e-Science proposal: Swedish e-Science Research Center (SeRC), bringing together research groups into new focused collaborations.

Strong contacts already exist in the visualization field between academia, industry and public agencies in the Stockholm region and will be extended through the VIC-Sthlm “meeting place on visualization”, with support from the visualization program funded by KKS, SSF, VINNOVA, Vårdal, Invest in Sweden.

The long-term aim of this platform is to broaden it into other trans-disciplinary SimVisInt areas, create a basis for extensive external funding and a basis for strengthening faculty with positions in Scientific Visualization and Interactive Simulation, for example.

Computational Life and Cognitive Sciences

A major theme for research in Computational Life Sciences and Cognitive Systems Sciences is the interplay and potential mutual synergies that exist between computer and life sciences with implications for health care and information technology in general. These collaborations will strengthen our contributions to the two KTH platforms Technique for Medicine and Health, and Information and Communication Technology, and will further strengthen our position when it comes to local collaborations with the Stockholm Brain Institute (SBI), KI, NORDITA, and the “Science for Life Lab” (SLL) at KTH. It will also provide a basis for bidding for future national and international research funding in the areas where informatics/computer science and biological research meet.

“These projects will range from neuroinformatics projects, aimed at understanding different aspects of the brain, to cognitive computing and study of embodied cognition.”

To stimulate the participation of different research groups, collaborative activities involving more than one department will be initiated. At the start up phase, research projects and course activities around themes are planned such as workshops seminars and other meetings to decide the focus of the platform for the future.
Human Communication

The aim of the research in Human Communication Technology is a thorough understanding of human communication processes, enabling development of useful and expressive human-machine interaction and communication systems. Strategic areas are ICT in healthcare, education and entertainment, all seamlessly exploiting computers to support and augment human interaction.

“Based on models of human-human communication, we will develop state-of-the-art demonstrators, technologies and products involving users.”

The underlying rationale is that understanding human communication will form a solid base for developing human-computer interaction systems. Based on models of human-human communication, we will develop state-of-the-art demonstrators, technologies and products involving users. These will support and augment human communication locally and over distance and time, by non-intrusively exploiting computers in the human interaction loop.

The platform naturally connects to the KTH strategic platforms: Technology in Medicine and Health, and Information and Communications Technology.

At the start up phase, research projects and course activities around themes are planned such as workshops seminars and other meetings to decide the focus of the platform for the future.

Center for Security and Safety in Computing

Starting in summer 2009 we plan to build a center for research in security and safety in computing, to be based at KTH. The subject area is broadly construed to include all aspects of security and safety in the construction, management, and use, of computer-based systems, mainly determined by those active in the area.

The main objective is to develop and strengthen a research area of key strategic importance to the school, KTH, and the surrounding society, both in terms of teaching and research. The effort will be in collaboration with other interested parties at KTH and in the Stockholm area, in order to create momentum and visibility, to the benefit of all involved parties.

The outcome we envision is the creation of a center of excellence in the security and safety area, involving such things as a graduate school, industry and government sponsor programs, collaboration facilities, joint seminar programs, and collaboration projects, in both research and education.

The School already has pockets of strength in areas related to the research center, but a large part of the area is insufficiently covered. In particular, it is important to strengthen senior faculty in subjects related to practical computer security, in areas such as network security, operating systems security, and intrusion and anomaly detection, including data mining.

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In parallel with the establishment of the center, we will launch a new professorship in computer security, suitably profiled, announced widely and with an attractive starting package in order to attract strong applicants.
Development in Education

Undergraduate Education

During the 1960s and 1970s, the education focused in the undergraduate courses on basic numerical methods and computer programming. Since the 1980s, most degree programmes at KTH have included both a basic course in programming and a basic course in numerical analysis. Today, the School is responsible for more than 200 courses with a total of almost 1,400 full-time-equivalent students, including 200 degree projects. The courses cover all Bologna cycles, including Lifelong-Learning. Our main disciplines are scientific computing (25 courses), computer science (70), media technology (30), human-computer interaction (30), speech and music technology (15) and language (40 courses).

CSC offers two Master of Science in Engineering programmes (300 ECTS credits) in Computer Science (since 1983) and Media Technology (since 1999). Both programmes are the most popular in Sweden of their kind when it comes to the number of applicants.

At Stockholm University, CSC is responsible for a Master of Science and a Bachelor of Science degree programme in Computer Science.

At present, we have adapted the curriculum to harmonize with the Bologna model, but we expect our five-year Master of Science in Engineering programmes to remain as vocational degrees, as selected combinations of Bachelor and Master’s programmes.

KTH welcomes students from all over the world and actively encourages our own students to study outside Sweden. This makes language and cultural skills important. Our Language Unit therefore offers a wide range of undergraduate language courses as well as specialized advanced courses.

Educational programmes

The aim of the Master of Science and Engineering degree programme in Computer Science is to provide engineers with the prerequisites and ability to take part in and lead the assessment, development and introduction of new computer technology.

Mathematics and Software Engineering play a major part in the education. During recent years, the programme has been continuously assessed and revised, from first to final year. It will be strengthened e.g. by training in computer security and ethics, to meet the changing needs of technology and society. It is hoped that the introduction of mandatory degree projects for the Bachelor’s degree and conversion of the final two years to a Master’s programme will improve the time to graduation and increase the chances of international exchanges.
Educational programmes
Course offerings

“...strengthened e.g. by training in computer security and ethics,”

The aim of the Master of Science in Engineering degree programme in Media Technology is to provide engineers with the knowledge and skills to solve problems related to the design and use of media technology and mediated services in various communication situations. The students are prepared for tasks on both the sender and the receiver side, as well as the entire communication process in between. Here, too, a mandatory Bachelor’s degree project has been introduced, and the last two years will be a Master’s programme. In conjunction with these changes, other parts of the programme have also been revised.

“...in Media Technology the students are prepared for tasks on both the sender and the receiver side, as well as the entire communication process in between

The English one-and-a-half-year Master’s programme in Scientific Computing started in 1997. Students from 30 countries have taken part. In 2006, it was extended to a two-year Master’s programme. As programme coordinator, we will also run a joint Master’s programme Computer Simulation for Science and Engineering with three other European universities within the EU programme Erasmus Mundus.

The Bachelor of Science in Engineering programme in Media Technology is being phased out and the last student intake was in 2007. The one-year Master’s programmes in Software Development and Human-Computer Interaction began as one-and-a-half-year programmes and were intended as continuing education. In 2007 they were recast as one-year programmes, but have not attracted a sufficient number of students. The Software Development programme will therefore be discontinued, and the Human-Computer Interaction programme will re-emerge as a two-year Master’s programme in the autumn of 2010.

The School’s present majors and specializations will be converted to majors in the four new Master’s programmes in Computational Learning, Computer Science, Human-Computer Interaction, and Media Technology, which will replace the last two years of the five-year Master of Science in Engineering degree programme. This is planned to start in 2010. Computational Learning will be given entirely in English.

The earlier major in Business Systems and Media Technology (AFM), which was offered to students at both the Stockholm School of Economics and KTH, was replaced in 2007 by a two-year English Master’s programme in Media Management, will be in cooperation of the School of Economics.

The major in Biomedical Engineering was replaced in 2008 by a new two-year English Master’s programme in Computational and Systems Biology. We will also run a joint Master’s programme, Systems Biology, together with three other European universities within the EU programme Erasmus Mundus.

Over and above the new Master’s programmes, we are also planning for a new Bachelor’s programme under the working title of Simulation Technology and Virtual Design.

At Stockholm University, NADA teaches in the Bachelor’s and Master’s programmes in Computer Science and offers stand-alone courses in Computer Science and Scientific Computing. We will be deepening our commitment to the Bachelor’s programme in Biomathematics. The first step in this direction was taken just before the academic year 2009-2010, when the programme changed its name to Biomathematics and Computational Biology. We are also exploring the possibility of starting a Bachelor’s programme in Design of IT Systems for students who have studied the Social Sciences programme at high school level.

Giving the Master’s programmes in English will attract more students from abroad with different education traditions, and we are developing our way of receiving and taking care of these students further.

Course offerings

The School offers courses to all Master of Science in Engineering degree programmes at KTH and to the Science Faculty at Stockholm University. This applies both to those who want to specialize in our fields and those whose majors will be in other fields. The disciplines Computer Science and Media Technology are still relatively new and presuppose that the courses and programmes are continuously adapted to technical
developments and their impact of society. The students’ varying entry knowledge is a reality that we share with other Schools at KTH. One way in which we address this is to offer web-based preparatory courses in programming. To contribute to the education of the general public, we are considering setting up popular web courses in some of our subjects. These courses may also serve as a preparation for studying at KTH.

The basic courses in Scientific Computing focus on simple ideas and concepts and on numerical methods for solving engineering problems, often modeled with differential equations. Judging the reliability of the result is an important aspect. The basic courses lead up to solutions to realistic computational problems of relevance to the degree programme, which is now possible through modern software. The second-cycle courses offer deeper mathematical theory, a larger methods catalogue and projects with more difficult application problems. Apart from general and specialized courses in numerical methods, courses run jointly with other departments are given in computational methods for fluid mechanics, electromagnetics, material science and molecular dynamics problems. Additionally, courses are offered in computational programming and one course in visualization. Where appropriate, advanced level courses include preparatory items for students with different educational backgrounds, so that the courses suit more students.

In Computer Science, the basic courses concentrate on modern programming techniques with methods such as modularization and abstraction. Large courses also include algorithms, advanced data structures and software development techniques.

Specialization is offered at the moment in the majors, Master’s programmes and elective courses linked to the department’s research, such as Artificial Intelligence, Computational Biology, Biomedical Technology, Database Technology, Computer Security, Computer Vision and Robotics, Internet Programming, Internet Technology, Computational Learning and Neural Networks, Software Systems Technology and Theoretical Computer Science. The fields of language technology, graphics and interaction programming, and visualization are developed cross-disciplinary specially within Speech, Music and Hearing, Human-Computer Interaction and Numerical Analysis, partly in line with the thematic platform.

In Media Technology, the education deals with technology and methods for the full spectrum of media types and services, from printed communication to interactive digital media. This comprises the study of efficient and innovative use of technology in the media industry and among consumers. In the Master of Science in Engineering programme, the majority of the courses are grouped under the majors Interactive Media Technology, Image and Video Technology, Sound, and Printed Communication. Specializations at Master’s level are also offered on the Master’s programme in Media Management.

Human-Computer Interaction (HCI) addresses the cooperation between people and computerized technical systems. The School offers courses in HCI at basic and advanced level, along with courses in communication, graphics and language technology. Specialization is offered through several majors, adapted to their respective degree programmes. In particular, different methods are studied for the design of computer support so that the interplay between people and computers is powerful and simple, and computer support for writing, collaboration and media communication.

In Speech and Music Communication, the courses range from spectral transforms, audio technology and music acoustics to speaking and listening computers. Most of the courses are elective and are typically taken by students from the programmes in Computer Science, Media Technology, Electrical Engineering and Engineering Physics. The curriculum will be updated to the research edge with a new track for multimodal communication in the Master’s programme in Human-Computer Interaction, now in its planning stages. Also, web-based courses in entry-level topics, starting with Music Acoustics, will be developed both as a teaching tool and as part of a student recruitment strategy.

In Language, we offer a broad range of courses in English, German, French, Spanish, Italian, Russian, Japanese, Chinese, Swedish, and Swedish as a Foreign Language. In total, about 130 course modules are given with approximately 3,000 course places a year. There are four different course levels for most of the languages, and a mandatory placement test guides the students to the right course level. The courses at basic level provide students
with elementary practical language skills: a certain ability to express themselves in speech and writing and to read general texts. Courses at advanced level focus on technical language to train the students’ spoken and written skills in preparation for an international career. The Master of Science in Engineering programmes in Chemistry, Information Technology, Microelectronics and Computer Science all have international majors where the students can supplement their degree with a language certificate comprising 45 ECTS in German, French or Spanish, or 60 ECTS in Chinese or Japanese. The students also have the opportunity to study for one or two semesters in a country where the language is spoken.

Stage Goals Undergraduate Education

Stage Goals Undergraduate Education in Three Years’ Time 2010-2012

- Number of applicants per place
  At least 1.5 first-choice applicants per place in Master of Science in Engineering programmes.
  At least 30 enrolled students per Master’s programme.

- Admissions:
  At least 25% women in our courses and 20% in our programmes.

- Degree of performance
  An examination/course pass rate of at least 85%.

- Annual completed degrees
  90 in the Computer Science and Engineering programme and 40 in the Media Technology programme. When all of the Master’s programs have been introduced, the total goal is 200.

- Course leaders
  At least 80% of the department’s courses at advanced level in all technical subjects have course leaders with doctoral degrees.

- Admission requirements
  Investigate the possibilities for admission on other than only averaged out grades. If the possibilities seem promising, we will carry out limited trials.

- Follow-up of studies:
  Introduce an active and early follow-up of studies to reveal and support students who need extra assistance.

- Pedagogy
  Refine the teaching to adapt it to one-hour lectures.

- Teachers’ pedagogical skills
  Bring in a pedagogical expert for the appointment of all teaching positions. Investigate the possibility of introducing a pedagogical career path.

- Student culture
  Along with the students, influence the student culture so as to increase the focus on studies.

- Contact students/teachers
  Evolve a strategy for communication between the School faculty and the students.

- Links to research
  Systematically offer interested engineering students from second year onward the chance to take part in and contribute to the work of the School’s research groups.

- Fulfilling goals
  Appraise the extent to which the student is fulfilling the goals of the curriculum rather than assuming that they have passed certain courses.
Links to research

We are striving to improve the insights we offer all our students into research at the School. On the one hand, teachers are encouraged to talk about their own research while teaching; on the other, workshops are arranged to bring students directly into contact with the School’s researchers. One step in this direction is the reception held for the first time in 2005 for new engineering students of Computer Science and Media Technology, and from 2007 for the students at Stockholm University taking the Bachelor’s programme in Computer Science. The School’s researchers and teachers hold a reception and open house and present their research work. Another step is student-directed seminars featuring topical research. Our intention is more systematically to invite interested students from second year onward to participate in, and contribute to, the work of the School’s research teams. The School has set up an “Advanced Individual Course”, so that students making such contributions can count them as part of their degree programme.

“Advanced Individual Course – Our intention is more systematically to invite interested students from second year onward to participate in, and contribute to, the work of the School’s research teams.”

Recruitment of students

The number of first-choice applicants for our Master of Science in Engineering programmes has decreased since the 1990s, but is still good, with almost two applicants per place. The reduction is partly a result of a generally diminished interest in engineering studies, but also of a substantially increased number of places at other educational institutions in Sweden. Of particular concern is the drop in the number of female students in the Computer Science programme. The shrinking batches of young people along with changes in eligibility requirements will be a great challenge to overcome in the next few years.

Improving recruitment to engineering education is a national scheme in which KTH takes an active part, through various efforts on the Science and Technology Delegation, among other things. The School is also involved in various ways, and we take part in KTH’s efforts to improve the marketing of our Master’s programmes and thereby recruit well prepared, better motivated students. The newly instituted Alumni Association of Women Engineers in Computer Science will be an important resource in this work. Special efforts will also need to be made through visits to schools and through activities at KTH and Stockholm University for both students and their teachers at senior high school and lower levels. In our recruitment, we will increase cooperation with the student organizations to achieve a more coordinated reception. This is particularly important for recruitment of students with a different educational background. To catch the interest of new groups and a larger number of women, we have established international majors in Computer Science as well as a major in Speech Technology. Since 2008, the School has arranged an annually recurring “Family Day”, when the student’s families and prospective students are invited to enjoy a stimulating program. We have also initiated a new scheme known as KTH Junior for (fifth- and sixth-grade) primary and junior high school pupils. Another way to interest more people in university studies is to use our automatic program testing system Kattis, where we can publish problems on the Internet.

To catch the interest of new groups and a larger number of women, the School forms an organization like the international Women in Computer Science.

Pedagogy and finance

Student learning is the guiding light of our pedagogy. Therefore, we use forms of teaching and examination in our courses that focus on the students’ own active work. Over the last 15 years, resources have been drastically cut, almost halved, at the same time as the number of places has substantially increased along with the spread in entry knowledge. This forces us to review continuously our forms of teaching and the infrastructure of undergraduate education. We are working steadily toward gradually altering teaching
and examination so as to maintain a high level of quality but within given financial boundaries. However, improvements in pedagogy cannot completely bridge these realities, and we run the risk of fewer students achieving the desired level of competency and thereby not successfully completing their programme. The aim of the School is for every subject to pay its way, even if each individual course does not.

We have drawn up a Code of Honor and rules for examinations. It draws attention to the interest shared by teachers and students alike in fostering an open atmosphere, characterized by confidence and mutual trust, where everyone contributes to the quest for knowledge in a positive academic spirit. We can then concentrate more on pedagogical examination forms by using the available time to develop knowledge rather than check completed work. All of the students are introduced to the School Code of Honor at the start of their degree programme and of each course. In this way, the School’s values and norms are made visible among the student body.

Examinations must be goal-related and at the same time economically viable. We are working toward a general transition from large written final exams to small quickly corrected exams combined with other forms of examination such as oral examinations and project work.

Quality development

To provide the students with good opportunities to choose correctly and to plan their education well, we formulate clear and useful course objectives for all of our courses. All information is available on the Web, where we also describe and motivate the various forms of examination we apply.

“We will also be encouraging teachers to take part in exchanges with other universities, industry, the business community and senior high school.”

To enhance the education and adapt it to the needs and ability of the students, we have, for several years, been conducting course analyses after every course offering, which are discussed by a group of teachers and published on the Web. Changes planned for the next course offering are thus easy for the students to find, which increases their chances of making a better choice of study.

A good example worth being inspired by is the "programme-integrated course" in the Media Technology programme, where all students in the programme meet in small cross-year groups together with a teacher/mentor after each half-term and discuss all of the courses and their placement in the education. This allows the views of all of the students on all of the courses to be captured, and the students are encouraged to reflect on their education. It also means that all of the faculty teaching in the programme gain insight into the whole education.

To gain overarching information on, and assessment of, our curriculum, we have supplemented the course questionnaire with questionnaires to graduates and alumni.

The teachers are encouraged to take courses in pedagogy at KTH, Stockholm University or other universities, and we arrange regular pedagogical seminars and teachers’ meetings. We will also be encouraging teachers to take part in exchanges with other universities, industry, the business community and senior high school.

Uppsala University has designed a “Pedagogical Program” which clearly and concretely summarizes the university’s pedagogical visions and goals. We will learn from this and develop our own pedagogical program.

Throughput, examination and educational administration

The completion rates for our degree programmes are too low. We will take several measures to improve this, including the introduction of a subject-specific study advisor service for choosing courses and majors. We will also permanently establish the “kicking out project” initiated in 2008, in which a teacher contacts student who are close to finishing the programme and
Study environment

encourages them to complete their studies. At course level, we have earlier sought out students who were having problems with their studies. We are continuously analyzing examination results and apply special measures in courses with poor results. To support students who are finding oral and written presentation difficult, we intend to start a language workshop at KTH. Along with ICT and the Mathematics department at SCI, we are reviewing ways of modifying the mathematics courses to better suit the students in the degree programmes we are responsible for.

When assessing whether or not the aims of the curriculum have been fulfilled, we will focus on the breadth and content of the student’s education rather than following a list of mandatory courses. This approach will lend new meaning to the term “mandatory course”, as a guaranteed path to a degree, but not the only path.

“kicking out project”
“...focus on the breadth and content of the student’s education rather than following a list of mandatory courses.”

Today, the School’s educational administrators and student service are located in several places. Our ambition is to gather this activity under one roof. We are continuously working on improving the administrative systems to simplify the administration and develop some of them in-house. Thus, for example, our old result registration system Res will be replaced by the more modern, easier-to-use Rapp, with more services.

Study environment

For many years, NADA and CSC have provided a well functioning study environment comprising round the clock available computer rooms, plenty of guidance and student service. The School runs computer rooms with about 130 computers for the Computer Science and Engineering and Media Technology programmes, and over and above these, 90 computers for courses in other programmes. To achieve high operational security at a reasonable cost, all computers are connected to server computers. The students are encouraged to cooperate during laboratory sessions and in projects and the computer rooms are purpose-built for group work such as this, with adjacent reading places available round the clock. As the technology changes, the students will increasingly own their own laptops. We intend to continue using computer rooms, but these will be possible to use in a more flexible way than today and serve as a combination of individual reading places and rooms/space for group work. The School aims to offer powerful computers, advanced software and a good working environment. KTH provides a wireless network on the whole campus.

The School has appointed a working group to inspect the teaching premises and student work spaces so that they are well suited to their purpose. One result is that we have managed to secure access for teachers to the teaching premises outside scheduled hours to allow them to check equipment and prepare their teaching.

Since 2006, CSC has offered web-based courses in cooperation with the KTH Resource Centre for Netbased Education (RCN). We intend to further develop the collaboration to be able to offer the introductory programming course in English as well. Via the learning platform Bilda, we also offer our incoming students web-based courses in the Swedish language.

Compulsory membership of the Student Union will be abolished, and this may entail changes in the way we interact with the students; however, our interest in cooperating with them holds firm and we wish to develop this cooperation.
Graduate Education

The School's graduate education will from 2011 be organized within programs in close connection to the academic areas. This will give a better structure for the students and make the studies more efficient. The education is, and will continue to be, internationally recognized as high class. We aim to produce researchers that are in demand and can pursue careers as researchers and teachers at universities and colleges as well as applied researchers in industry. Our annual quantitative goal is 15-20 doctoral degrees. We create a good foundation for our research education by maintaining a balance between depth and breadth. The research and research education courses have a high international quality and penetrate deep into specific research field. The research training also provides broad scientific, societal and cultural insights. The quality of our dissertations is of paramount importance for the School's position as a research education establishment. The skill and professionalism of our primary advisors and the competence of the independent researchers/scholars, at associate professor level, that we engage as opponents and members of dissertation committees are of crucial importance to upholding this quality.

Skills

Apart from subject-specific specialist competency, the research education is expected to provide also other important skills for a successful professional career. One example is the ability to speak and write and in general communicate well with both specialists and laypeople. It is consequently important that the education contains components providing these skills but also that the student regularly participates both as listener and speaker at conferences and research seminars. Another important training for a doctoral student is experience of pedagogical work and of working in research projects. Teaching at university level involves participating in the faculty community and is a prerequisite for an academic career. Our policy is to restrict students teaching load to at most 20% of full time, in order to limit the time from start to PhD defence to 5 years.

Employment and recruitment

Secure funding is important for success in research studies. Our goal is to offer all doctoral students a paid Ph.D. position, but we believe that alternative funding during the first year can be advantageous. For the student, doctoral studies entail a large investment for their future professional lives. An incorrect choice made in the admission process can have serious consequences for all concerned. Thus, to create a better basis for such a decision, a brief probationary period may be justified in some cases. Having a probation period presupposes the signing of an explicit agreement between the individual and the School.

It is important to set up stage goals during the study period. One such goal might be a Licentiate degree, even though the final goal is a doctoral degree; others might be formulated in terms of dates for finalizing articles or giving presentations in seminar series. Annual seminars or halfway seminars with several active senior researchers in the audience are desirable. Crucial factors for recruiting and accepting a Ph.D. student are the availability of advisors and sufficient funding. The School has a good supply of professors and associate professors.

Process

Advising is important, and every research student has the right to a committed primary advisor. As a rule of thumb, we believe that a student should have the opportunity to meet his or her advisor at least once every two weeks. Furthermore, all students must have a secondary advisor. To create a lively research environment, it is essential to have younger researchers in the
departments. Apart from creating a better environment for the students, they provide better continuity and indicate possible career paths. To monitor a student’s progress and working conditions, annual advisors’ group meetings are held, where the student meets a broader group of senior advisors. In connection with these, an individual study plan is updated. This is an agreement between the School and the student which details not only the content of the studies but also the intended degree, planned study time, funding, and available advisory support.

The new graduate programmes will increase collaboration in teaching PhD courses between the departments. We will also involve faculty as well as students in improving the planning and scheduling of PhD courses.

Stage Goals Research Education in Three Years’ Time 2010-2012

- The number of women admitted will increase to 25% but we are aiming for 30%
- The number of doctoral degrees is maintained at 15-20/year
- Coordinated course offerings advertised with good foresight
Development in CSC’s Research Fields

“...the excellence will be maintained through the present staff and continued recruiting.”
“...development by encouraging all faculty and graduate students to participate actively in suitable subgroups.”

Scientific Computing

Scientific Computing or Computational Science and Engineering (CSE) is a suitable name for our activity, which is somewhat wider than Numerical Analysis since it also comprises relevant parts of Mathematics, Computer Science and Applications. Scientific Computing is the science where mathematical models and numerical methods from science and engineering are developed, analyzed and implemented on various computer architectures.

The research at the department of Numerical Analysis (NA) has traditionally focused on numerical solutions to differential equations with applications. Since 1963 about 30 PhD students have been supervised and examined by Prof Germund Dahlquist with about half of them specializing within this focus area. When Professor Dahlquist retired in 1990, Björn Engquist was appointed as his successor. During the 90’s, 11 Ph.D.s were awarded and 8 Licentiate degrees. During the period 1995 to 2005 the activities increased substantially within PSCI (Parallel and Scientific Computing Institute), a VINNOVA funded project. The activity within PDC also grew, as well as the involvement in EU sponsored programmes, with a total number of about 15 EU projects. In the period 2000 to 2008, 20 Ph.D. and 11 Licentiate degrees were awarded.

NA today comprises five professors, nine associate professors, five of whom have docent competence, one assistant professor, one junior lecturer, three post docs and 14 graduate students. Attached to the group are also about 30 International Master’s students within the programme Scientific Computing and some 10 regular students from KTH working with their Master’s Thesis. The group is very well recognized internationally and large enough to offer a vital and inspiring research environment. The rapidly increasing importance of computational science motivates further growth at KTH. Through continuous successful recruitment of young, promising associate professors, the age structure is now reasonable but with a certain shortage of middle-aged faculty. Even though several of the professors will retire during the next five-year period, the excellence will be maintained through the present staff and continued recruiting.

The present research, considered as world leading within certain areas, is still focused on numerical solution of differential equations, e.g. computational fluid dynamics, computational materials science, telecommunication, and biocomputing. These areas are characterized by models with very different time and space scales, by great complexity in the model descriptions, and also by elements of stochasticity. Their treatment requires new demands on depth and rigor in theory and techniques, and also for combination of knowledge from various disciplines and effective use of high performance computing. This research area will be central for development in science and engineering and for creation of engineering tools for industry and administration. To summarize, we foresee that the research within multi-scale techniques, stochastic differential equations, dynamic geometry handling and general adaptive software systems will grow.

As for the research and graduate education, we want to increase the fundamental research and graduate teaching in the core areas of scientific computing. Concerning the applied research, we intend to build on the success of PSCI and PDC to further develop our excellence together with other partners from KTH, e.g. KCSE, Linné Flow Center and CIAM; see more below. The department today consists of several well-functioning subgroups, usually consisting of one research leader and a few graduate students. A good example of such a subgroup is the newly established...
Computational Technology Laboratory. We will continue that development by encouraging all faculty and graduate students to participate actively in suitable subgroups.

The department will be central in the CSC thematic platform SimVis Int and is also essential for the KTH strategic funds e-Science application. We foresee very active collaborations with new partners within new upcoming projects.

**Education**
NA is presently applying to launch a Bachelor’s programme in Simulation and Visualization techniques, which in a modern simulation environment couples fundamental concepts in mathematics and physics to scientific and industrial applications. We will have the central role in this programme but aim to collaborate with many other departments.

The International Master’s programme in Scientific Computing has had a great impact on the continuity of offering advanced courses in Numerical Analysis/ CSE to KTH students and has also been a source of recruitment of graduate students. We intend to develop this programme within an Erasmus Mundus programme together with CSE departments in Berlin, Delft and Erlangen. Another Erasmus Mundus application titled “High Performance Computing” together with Dublin, Edinburgh and Wuppertal has been submitted. Important contacts have been established that we expect to result in several double degree programmes. Such collaboration has already been established since 2008 between KTH and Erlangen University within a CSE Master’s programme.

**Changes in staff during 2009-2012**
CSC is giving high priority to once more filling two professorships, whose incumbents will retire during the time period 2009-2012. The professorship in Numerical Analysis was established in 1963 and the present incumbent (Engquist) will retire during this period. We will announce an open position in Numerical Analysis - Development and analysis of numerical algorithms. The professorship in Applied Numerical Analysis was established in 1999 and the present incumbent (Johnsson) will retire during the period. The activity has been focused on High Performance Computing and we will announce a new professorship within the period; see PDC below.

Since 2005 we have hired four associate professors and one assistant professor to replace those who have retired or will retire in the near future, but to secure the teaching duties at elementary and advanced levels we may need to employ a few more, especially within Scientific Visualization and Computational Biology.

**KCSE - KTH Computational Science and Engineering**
Large-scale computation is currently used in many different disciplines. KCSE has been developed as a joint center for interested researchers and departments from KTH. Now eight sections/departments from five of the 9 schools of KTH are partners. The activity consists of seminar series, support to graduate students with appropriate courses given by KCSE, international contacts and investigations of computer resources, etc. KCSE is supported by KTH and the Swedish Research Council (VR). We regard the NA activities as the core of KCSE.

**Linné Flow Center**
The research within the Linné Flow Center is focused on fluid dynamics. Professors and graduate students from CSC participate in research activities concerning multiple phase flow, phase transformations, aeroacoustics and microgeometric flow.

**CIAM – Center for Industrial and Applied Mathematics**
CIAM is a research environment funded by KTH and the Swedish Foundation for Strategic Research (SSF), with focus on industrially applied research. Partners come from the departments of Mathematics, Theoretical Computer Science and Numerical Analysis. This five-year-long project is strengthening the collaboration between these disciplines and industry and will result in about ten Ph.D. dissertations.
Research in advanced data management will initially focus on storage and data transfer issues, particularly the management and scheduling of data transfers, also in the presence of firewall constraints, co-scheduling of data and computational activities, and the impact of commercial offerings like Amazon’s S3 in the academic context. Issues in long term data preservation and duration, knowledge extraction, and data mining will also be covered. Security and privacy considerations will be a horizontal theme in this context.

In addition, scientific research is moving towards collaborative environments where resources of different research groups are being jointly used for a common scientific goal. PDC will address issues in these kinds of eInfrastructures, particularly in the security, scheduling and data areas. Efficient networking is another cornerstone for eInfrastructures and PDC will develop the required competences in high performance networking.

PDC’s research activities will be complemented by a comprehensive education programme targeting graduate and undergraduate courses in computer and computational science. A particular focus will be laid on the foundations of parallel and distributed computing, and the successful summer school “Introduction to High Performance Computing” will be continued.

The professor in Applied Numerical Analysis will retire within a couple of years and the School needs to build a stronger faculty within the area. In the near future, we will employ a visiting professor with focus on parallel and distributed computing until we have appointed a professorship in High Performance Computing. We also aim to appoint at least one assistant or associate professor and some graduate students.
Computer Science

Research in Computer Science has essentially been established at NADA since 1983. During the pioneering years 1963-1982, computer science research was part of numerical analysis, and during the 1970s, 10 Ph.D.s were awarded in the subject under the supervision of Professor Dahlquist. During the 1980s, two professorships in computer science were created, for Arnborg and Eklundh, and six Ph.D.s were awarded. During the 1990s, two more professorships were added, for Hästad and Christensen, and 32 doctoral degrees in Computer Science were awarded.

The activities are conducted in three departments: Computational Biology, Computer Vision and Robotics, and Theory. Below we describe these departments separately.

Computational biology

The mission of the department of Computational Biology is to be at the forefront of mathematical modeling and analysis of biological data, to develop algorithms and software for such models, and to be actively engaged in joint projects with experimental biologists producing such data. The main research areas are neuroinformatics, especially Computational Neuroscience (memory, learning and neural plasticity, sensory-motor integration, decision making, olfaction, inter- as well as intracellular signaling), Biological Physics/Systems Biology (mechanisms of gene regulation, non-coding RNA) and Bioinformatics/Computational Molecular Biology (comparative genomics, modeling evolution, gene regulation, modeling cancer progression, mRNA editing). On the national and international level, the department is engaged in the Stockholm Brain Institute, the International Neuroinformatics Coordinating Facility, the KTH ACCESS Linnaeus Center, and the Stockholm Bioinformatics Center, as well as in several European research projects.

Traditional qualitative and conceptual models in biology and medicine have for some time been supplemented by quantitative theories and mathematical models. Computational biological models are indispensable to describe in detail and to analyze complex biological processes at levels from molecules to the brain. Models can add to understanding of experimental observations of phenomena and relationships, and to identifying underlying mechanisms, particularly when the amount of data is vast. This methodology has a large generality and will gain in importance as experimental data accumulates and the need for systematic analysis increases. Computational biology at molecular, cellular and systems level is therefore regarded as being of key strategic importance for developments within the pharmaceutical and biotechnological industry.

Computational Biology (CB) is an interdisciplinary department offering graduate programmes in both Computer Science and Theoretical Biological Physics and also graduate students in Neuroscience at KI. The department today has four professors and four associate professors. In additions there are four postdoc researchers and about 15 active graduate students with a total research staff of about 30. Since 2000, 10 students have graduated with a Ph.D. and two have taken a licentiate degree. The department also has a significant amount of national and international collaboration, shares some of its staff and its current premises with Stockholm Bioinformatics Center (SBC), and is placed in close proximity to the Nordic Institute for Theoretical Physics, (NORDITA), which has a strong group in Computational Neuroscience.

Over the time period 2010-2015, CB plans to develop and increase its efforts in the following research themes:

- The availability of high-throughput biological data has led to bioinformatics and neuroinformatics. Making sense of massive and quantitative biological data is an emerging unifying theme across the research groups of CB having strong ties to machine learning, inference and other fields.
- The present revolution in DNA sequencing technologies gives rise to a wealth of computational problems related to, for instance, enabling and optimization of sequence assembly from different types of data.
Computer Vision and Robotics

Research in image analysis and computer vision is aimed at the automatic extraction of information from images or sequences of images. This will be of importance when we want to manage and search in the large quantities of digital image data that are generated by our own handheld or wearable cameras, mobile phone cameras or in various media such as the Internet or broadcast TV. Advanced algorithms of computer vision will also make possible new forms of 3D Visualization based on real image inputs.

Another aim of the research is to develop an artificial vision system similar to that of humans with the purpose of controlling (semi)autonomous robot systems. Different types of robotic applications will eventually require systems with visual capabilities that resemble human vision system functionality. In addition, such a system can also be put on an intelligent wheelchair and extend human visual abilities when required.

Another research focus is a development of robot systems that can perform tasks in natural environments in a similar way to humans. Particular challenges include the development of robust systems that can assist humans in their everyday life or serve as a help to the handicapped. The common requirements for such systems are advanced perceptual capabilities based on robust and flexible sensor integration including laser and sonar data apart from vision.

The department today has two professors and two assistant lecturers. In addition, there are about eight postdoc researchers in the group. The number of active graduate students is about 15. Since 2000, 21 students have graduated with a Ph.D. and five have taken a licentiate degree. The department also has a significant amount of international collaboration including groups in Europe, Japan, USA and Australia. The goal for the next period is to augment the faculty in order to maintain its international strength. The research is supported by Swedish funding agencies such as VR and SSF, but there is also a large activity in European projects.

The whole field of artificial intelligence and especially sensory processing has in recent years moved towards methods and algorithms based on learning from exemplars in supervised or semi-supervised ways. A central concept in learning-based methods is how memory is organized and efficiently integrated into a cognitive system. Understanding memory, both from a computational and biological view, is therefore a core problem in any future research in this area. This
will be specifically targeted in the recent five-year SSF project “Wearable Visual Information Systems” with the ultimate aim of creating a framework for human visual memory support. This links research at CVAP closely to the modeling of biological memory mechanisms within CB and further collaborative efforts between the groups are being planned.

The fact that computational learning is becoming as prominent as a research tool has also prompted the creation of a specific Master’s programme in this area. This will provide a common methodology for research in various fields such as computational biology and neuroscience, speech and text processing as well as computer vision.

Earlier research in robotics at CSC has concentrated on the design of relatively simple systems for navigation in natural indoor and outdoor environments. By combining more advanced methods for perception, developing new methods for statistical planning, decision making, learning and sensors integration, we intend to achieve functionalities with a much higher level of autonomy than those existing today. In addition, we are working on developing systems with a human-in-the-loop, where humans and robots perform tasks by collaborating with each other. Based on these, we foresee being able to develop systems that can provide assistance to humans in both domestic and industrial settings.

Center for Autonomous Systems – CAS

The Center for Autonomous Systems, (CAS) is a research center at KTH focusing on (semi-) autonomous systems including mobile robot systems for manufacturing and domestic applications. The centre hosted by CSC was inaugurated in August 1996 and includes four departments at KTH: Automatic Control, Computer Vision and Robotics, Mechatronics, and Optimization and Systems Theory. The major part is at present within the research at CVAP, as mentioned above.

Theory Group

The overall mission of the theory group is to carry the culture of theoretical computer science. This entails developing and disseminating knowledge in theoretical aspects of computer science. While most of our research has applications in the medium and long term, activities in some areas, such as in computer and information security and uncertainty management, may also be of short-term practicality.

A key task of our group is to pioneer application-related fundamental research that can give rise to more application-dedicated groups, with already trained personnel. A showcase example of this is the creation, in 2006, of the bioinformatics group in the Computational Biology department of CSC.

The group, considered as world leading within certain areas, has four professors, eight associate professors, one assistant professor and about 10 graduate students. CSC is currently in the process of hiring one or two lecturers and it is quite likely that one or both of these new recruitments will end up in the theory group.

Our involvement in education is substantial with 13 PhD and three licentiates in the period 2000-2008 and we have supervised over 500 MSc/MScE theses within the same period.

Several members of the group have held grants from the Swedish Research Council (VR) during this period but we have also received external funding from the European Research Council, SSF, VINNOVA, EU FP6 and FP7, Saab, Swedish and US defense, the Nordic Council of Ministers, and the Swedish Institute of Computer Science. We have participated or are participating in the excellence centers PSCI, ACCESS, and CIAM.

The activities in the theory group have been characterized by diversity with a large number of special-
ties, some covered only by single individuals while the typical size of a research group is one senior researcher and one or more graduate students.

Areas studied include Approximation Algorithms, Bioinformatics, Circuit and Proof Complexity, Cryptography, Formal Methods for Computer and Information Security, Formal Testing, Internet Technology, Language Technology and Uncertainty Management. Most of the present activities are supported by external grants, mainly from VR, and thus they have been found, by international evaluators, to be of high intra-scientific quality.

The immediate goal of our research is to further understand theoretical questions related to computer science. Apart from the research itself, an important goal is to create a research environment which can cross-fertilize with the educational environment at CSC. Particular importance should be accorded to the Master’s programmes of the school, particularly those emanating from the Computer Science and Engineering programme. Members of the theory group have historically played a central role in the “D-program” and we feel that maintaining a strong computer science programme, supported by a diverse research environment, is a must. A consequence is that we need research activity in a broad range of topics that appear in undergraduate computer science education.

In order to fulfill this vision, we will establish high quality research in areas such as safety/security, software engineering and database/distributed systems, but we do believe that a key area to address is computer security. The department has very strong competence in some subareas of security like cryptography and formal methods related to software security and correctness, but the School needs competence in computer security in the more applied sense, addressing everyday questions in standard computer environments.

The most pressing reason to build a research activity in the area of applied security is as a foundation of high quality education. We see an expanding need for courses from basic level security for essentially all computer science majors to specialized courses on advanced and research level. In the long
Media Technology and Graphic Arts

Media take an ever-growing share of our everyday life. The emergence of digital media and new information technology has had profound and lasting effects on society, culture, consumer behavior, democratic processes, and business in the IT, telecoms, consumer electronics and media industries. In particular, the Internet has grown into a truly worldwide open infrastructure for information, communication and commerce, and has become a powerful tool for creativity and innovation.

The media industry landscape is also rapidly changing. The network-based media industry is global and multi-faceted as innovative entrepreneurs are developing new types of content and services. New media production and distribution modes, such as peer production and distribution, are challenging the established practices of the industry. New media devices and tools are redefining the roles of consumer and producer as people have become more active as creators and participants in the media. New applications, such as social networking, are changing the ways we communicate and also how we understand communication.

In general, our department is in a good position to reach and maintain international excellence in several subfields of media technology research. The media industry, as well as all other industries and organizations using mediated communication, has a strong need for knowledge, guidance, and innovation in a situation of continuous technological and societal change. Our vision is to grow to meet these demands.

To educate engineers and scientists in the rapidly expanding and changing world of media, technical university programmes have been established that attempt to cover the needs of this growing industry, as well as to study the economic, societal and cultural impacts of developing media technology. There is a demand for highly educated talent that will drive this media development, shape the strategies of existing and novel companies in the industry, and create new services, and will be able to creatively exploit and expand the possibilities of new technologies.

The research can be characterized by the following six partially overlapping areas: Media Production Technology and processes; Media Technology and Arts; Media Industry Development; Media, Society, and Culture; Learning and Knowledge Media; and Media and Sustainable Communications.

The Department of Media Technology and Graphic Arts (Media) is a multidisciplinary group focused on technology and methods for supporting human communication over distances in time and space. This includes a wide range of media, from printing and publishing to digital interactive media, from broadcast media to mobile social media. Our education and research also covers the implications and effects of using media technologies from human, social and design perspectives. Currently there are two professors, four associate professors and four assistant professors. The department is collaborating with a broad spectrum of academic institutions, such as the School of Art, the School of Dance and Stockholm School of Economics. The group also collaborates with several Nordic universities as well as with universities in China, Russia and USA.

The professor in Media Technology, Nils Enlund, will retire in 2011 and will create a vacuum because of his breath and devotion to the education in Media Technology, specifically the Master of Science in Engineering programme. The School will announce an open Professorship widely in Media Technology. We also need to announce several new associate or assistant professors focused on image and video technology, interactive mobile media, and media and arts.

Center for Sustainable Communications

The Center for Sustainable Communications hosted by CSC is a unique collaboration that combines research in the School of Architecture and Built Environment and CSC. This VINNOVA Center
of Excellence brings together several key competencies of relevance for enabling innovative media and communication services for sustainable practices. The core of the Center is the meeting between researchers in media technology and environmental strategies research from KTH and industrial and public partners. Involved in the Center are thus scientists in media and communication technology, interaction design, environmental systems analysis, industrial ecology, built environment analysis and urban planning. The Center also involves leading scientists in architecture, ethnology, ecology, economics and sociology.

**Human-Computer Interaction**

Human-Computer Interaction (HCI) is a young research area. It deals with the interaction between humans and computer systems, as well as the interaction between humans via computer systems. The field is multi-disciplinary, with influences from several disciplines such as computer science, psychology, work life research, communication studies, linguistics, ethnology, sociology and design. The HCI subject has strong ties to information technology and its applications, but also to other areas where issues of the use and usability of technology are relevant.

NADA was one of the first departments in Sweden that hosted both research and education in HCI. The research group Interaction and Presentation Laboratory (IPLab) started in 1985, initially focusing on computer-supported writing, graphical design and programming. The group’s activities grew during the 1990s, especially in the area of computer-supported cooperative work. In 1995, the group obtained support from NUTEK/VINNOVA for the establishment of a center of excellence, the Center for User-Oriented IT Design (CID), which focused on user-centered development processes in collaboration with industrial parties and user organizations. Together with the emerging Graduate School for Human-Machine Interaction (HMI), CID contributed strongly to the growth of the number of graduate students in HCI. The HMI school was a result of collaboration between KTH, Stockholm University and Linköping University, with funding from the Foundation for Strategic Research. The first professorship in HCI at NADA appeared in 1997, and HCI was established as an independent subject of research studies in 1998.

Within CSC, the groups IPLab and CID have now merged into the HCI department, which currently includes three professors and one affiliated professor, six associate professors, of whom five have docent competence, and one assistant professor. Furthermore, the group includes 10 post-doctoral researchers, two other researchers and 10 graduate students. In total, 20 have obtained a Ph.D. in HCI and another 10 completed a licentiate degree. Recently, the group has recruited a new professor, since both the other professors are approaching the age of retirement. The new professor covers technical, humanist and design-oriented aspects of the subject HCI. The group is also advertising for at least two associate professors, one with a profile towards interaction design and one with a profile towards human sciences.

The major strength of the HCI department is its multi-disciplinary competence profile that has been built up during many years. Some of the research topics that have been in focus during the past 10 years are: user-centered design, development and evaluation of IT support in workplaces, computer-supported work and digital communities, language technology and writing support, advanced perceptual interfaces, visualization, human-robot interaction, and computer-support for interactive storytelling and learning.

The group has established a large contact network through the work in numerous EU projects, several of which were coordinated by CID. The department of HCI intends to continue to develop as a well-known and active participant in the international research community. Our goal is to maintain the position as the leading HCI group in Sweden by 2010, in terms of research, graduate and undergraduate education, as well as relevance for Swedish industry and society.
In an international perspective, the HCI group has a unique strength in combination of competencies from different disciplines. This enables us to easily reach into new areas and establish contact with user representatives as well as collaboration partners from both technical and human sciences. To capitalize on this strength requires a clear recruitment strategy and better advancement opportunities for our younger HCI faculty.

The following areas have strong potential for further exploitation:

- Methodology for involving users in all phases of product and service design,
- Improved workplace use of ICT though quality assessment,
- Design for an elderly and disabled population,
- Multimedia technology for embedded systems in advanced medical processes.

The volume of activities of the group, in 30 courses in undergraduate and master education, in graduate education and research, as well as the wide scope of HCI, with design as a fast growing part of the field, internationally and in our group, strongly motivates a second professorship, in Interaction Design.

**Visualization, Interaction & Collaboration (VIC)**

The visualization area, including several senses such as seeing, hearing and sensing (haptics) under “perceptualization”, is becoming of central significance in most areas of research and education, in academy, industry, governmental agencies and society as a whole. It is an opportunity, and a responsibility, for CSC to take a leading role in visualization, in software and hardware methods as well as in advanced applications in many fields of research and development. CSC (and formerly NADA) has a long tradition in this field with the pioneering VR cube installed in 1998 and a focus on establishing broad competence in the current decade.

The KTH established center VIC – Visualization-Interaction & Collaboration – involving nine schools of KTH, is intended to provide, develop and demonstrate powerful resources in the form of competence and equipment for visualization, interaction and collaboration. This has been so successful in 2008 and 2009 that a fast expansion is foreseen: CSC trusted to host the visualization meeting place for academy, industry and society in the Stockholm region; three demonstrators funded from the Visualization programme grants; and considerable funding to CSC for visualization equipment from the Wallenberg Foundation. The School has also decided to establish a strategic faculty-funded Platform on Simulation-Visualization-Interaction, SimVisInt.

We plan to offer a multi-disciplinary education on master and research level and to strengthen the research in scientific Visualisation to improve the total process from modeling to production. Today we have recruited an associated professor and an affiliated professor, but in a near future we strongly need to expand the faculty including professors in e.g. interactive visualization and interactive simulation.

**Speech, Music and Hearing (TMH)**

The Department of Speech, Hearing and Music (TMH) includes the Speech Group and the Music Acoustics Group and the Unit for Language and Communication. The research is focused on speech technology and music acoustics but our ambition is to build a research activity in applied linguistics. Below we describe these groups separately.

**The Speech Group**

The Speech group has the ambition to reach both a deeper understanding of human-human communication involving speech and to create a new generation of speech-based multimodal human-computer interaction technologies. The focus of our research is to better understand human verbal and non-verbal communication. The main task is to understand and model spoken language, both in read speech and in interactional settings. A prerequisite for this is to have deep knowledge of human speech production, perception and interactional behavior. To reach our goals we must deepen and extend the scientific base, develop our core technologies and create the necessary resources.
The speech group, which has hosted the Center for Speech Technology (CTT) since 1996, engages a total of about 25 researchers and doctoral students, including three professors. The activities cover a wide variety of speech-related research topics, ranging from detailed theoretical development of speech production models, through phonetic analyses to various practical applications of speech technology. The close relationship between basic and applied research carried out within the group, as well as extensive collaboration with industry, has received recognition in several international evaluations and is noted as outstanding and world leading in the KTH Research Assessment Exercise. The speech group is research oriented in a maturing and expanding area where the need for teaching, education and training is concentrated at the advanced and doctoral levels.

During the period, cooperation will be developed further in research, development and education, both within KTH and with external partners. Active participation in several of the KTH platforms and centers are on the agenda in areas like ICT – The Next Generation, Center for Sustainable Communications, Technology for Medicine and Health, Computational Life and Cognitive Sciences, and Simulation-Visualization-Interaction. Cooperation in education includes the Master’s programmes in Human-Computer Interaction (a specialization in multimodal interaction) and Computational Learning, as well as in the Computer Science programme focused on language technology. The Human Language Technology Center (HLTC), created in 2008 to facilitate collaboration between Uppsala University, Stockholm University and KTH, will promote excellence in research and increase competitiveness, building on the participating groups’ unique combination of competence in both speech and language technology. Participation in EU projects will continue to be an important part of the research efforts. The Centre for Speech Technology (CTT) further provides a platform for cooperation and project funding with non-academic parties.

The group is under renewal since two professors (Rolf Carlson and Björn Granström) and four senior scientists will retire during the time covered by this plan. To maintain our international and national position and to meet the anticipated increased research and teaching demands of this area, the speech group urgently needs to create at least two new associate professorships in Speech Communication.

The Music Acoustics Group
Music acoustics has now developed into the large field of Sound and Music Computing (SMC). While classical instrument acoustics is still pursued, SMC refers to the whole range of non-speech human communication by sound. The Music Acoustics group has a strong international position, first established through the long leadership of Prof. Em. Johan Sundberg, and furthered by a high proportion of mid-career senior researchers. The group has ample ‘critical mass’ also thanks to its location within the department TMH and its experience of participation in many EU projects. Activities focus on the three main areas voice acoustics, performance science and instrument acoustics, in which the group is internationally renowned. The group currently consists of one professor, three associate professors, one postdoc, four graduate students, one active professor emeritus and one or two foreign visiting researchers.

The group will continue to build its expertise, working with new forms of musical expression, new and/or improved musical instruments, and with science and engineering that pertain to the human voice. An important new topic is the scientific study of human motion and gestures as expressive components of musicianship and dance. As the mobile phone develops into a universal personal appliance, new aspects will appear of how people use and relate to music. New collaborations with the speech group, the HCI group, and with the Colleges of Opera and Dance on KTH campus have been initiated and will be developed further.

In voice science, we conduct technical-acoustical research and training in collaboration with clinical faculties, mostly at KI, on the voice in the workplace and in the performing arts. Since 1988 we have used the label ‘KTH Voice Research Center’ to signify an informal collaboration which also includes the Linguistics department at Stockholm University. We aim to profile ourselves more explicitly as the primary Nordic resource for technical vocology.
With national-level competence in electroacoustics the group aims to expand its work on audio for telepresence and perceptualization. The VIC, the Centre for Opera and Technology, and the Centre for Sustainable Communications are all important partners in this regard. A key priority will be the establishing of a significant pan-KTH sound communication laboratory for education and research, ideally to be co-located with the VIC and ultimately adjacent to the envisaged KTH Conference Area in the upper courtyard.

The Music Acoustics Group seeks to establish an Erasmus Mundus joint doctoral programme in FP7 together with a number of its partner sites in Sound and Music Computing.

We thus foresee a need of associate professors in Sound and Music Computing and in Electro Acoustics to develop these fields within research and education.

**Center for Opera and Technology**
The Center for Opera and Technology, hosted by CSC, was established as a platform for cooperation between KTH CSC and the University College of Opera in Stockholm (OHS) in 2003 when OHS moved to KTH campus. The center conducts research related to the use of technology for extending and enhancing the communicative power of opera performances. KTH supports the center financially during the period 2008 - 2010. The activity is focused on the singing voice, stage design and creation technology, and mediated opera production. A current project deals with master class education over the Internet using state-of-the-art technology for communicating the sensation of being present in the same room. Symposia for professional singers and voice teachers/vocal pedagogues in the Scandinavian countries are organized every second year, featuring international keynote speakers. The center is a node in the World Opera foundation, a worldwide platform for exploring tradition and innovation in opera. A visionary project during the period 2009 - 2011 is a worldwide distributed opera stage, based on several locations in Europe and North America. The goal is to explore the artistic benefits of collaborative opera productions with artists performing simultaneously on different stages and communicating over the Internet.

**The Unit for Language and Communication**
The Unit for Language and Communication consists of an international group of teachers with 11 language teachers from different countries and a large number of hourly-paid teachers. The reason we have so many hourly-paid teachers is that we are forced to offer an increasing number of our courses in the evening. We wish to change this, since it otherwise becomes more difficult to recruit qualified teachers, and above all, teachers with research training. For historical reasons, the Unit for Language and Communication has mainly been a teaching unit. We would like to change this. Applied linguistics is an important and largely unexplored field in Sweden in spite of its great importance for technical communication within technology, the language is predominantly English. In 2005, our first teacher was awarded a PhD and employed as an assistant professor. Another of our teachers is pursuing doctoral studies, and in 2008, we were joined by a teacher with research training, whose field focuses on academic discourse.

We will be intensifying our efforts to establish applied linguistics as a research field at KTH and at the same time seek continued cooperation with language departments at other Swedish and foreign universities. In the wake of the ongoing internationalization of undergraduate education, there are interesting pedagogically-oriented research projects on language learning, parallel language competence and computer-based language learning. The research link between the Unit for Language and Communication and TMH consists at present of computer-based pronunciation training. A technically advanced, interactive pronunciation function, VILLE, constitutes a valuable component of the web-based elementary course in Swedish as a Foreign Language, and we see several possibilities for web-based learning in other languages with a multinational VILLE providing student support.

It is crucial that more teachers are given the opportunity to pursue research studies in order to be promoted to assistant professors. In the long term, there is a need to recruit a professor of Applied Linguistics.
Long-term development of teaching positions at CSC

“...to introduce a pedagogical promotion path...”
“We expect between five and ten associate professors to be promoted during the next five years.”
“The School will also extend its efforts to recruit more adjunct and visiting professors and guest lecturers.”

A decisive factor for the quality of the education is the teachers’ competence and commitment; they are unequivocally our most important resource. During the nineties, the number of teachers doubled to around 40 and the academic level was raised considerably. For example, the number of professors and associate professors more than quadrupled. This development has continued both through the teachers improving themselves and through recruitment of new members of staff. The School now has over 20 professors as well as about thirty associate professors, two-thirds whom are at ‘Docent’ level. Through careful staffing, which includes planning for long-term individual development, we intend to increase the opportunities for teachers to improve themselves continuously.

To guarantee that teaching merits are accorded the same weight as scientific merits, we are striving for the Faculty Board to introduce a pedagogical promotion path and to appoint a special pedagogical expert when new teaching positions are filled.

Since 2000, two new Professorships have been filled, two have been transferred from other departments, and 11 associate professors have been promoted to professors since the reform was carried out. We expect between five and ten associate professors to be promoted during the next five years. Many retirements in the coming years allow rejuvenation through the need to announce around 10 professorships in new and existing fields and as many associate and assistant professors. The School will also extend its efforts to recruit more adjunct and visiting professors and guest lecturers. In this context, it is crucial that they cover the areas we have identified in our future analysis.

Existing Key Professorships

High priority is given to retaining the key professorships after the incumbents retire. Several professors that have established their research and educational areas as well as successfully built up departments will retire during the coming years such as in numerical analysis, computer science, speech technology, speech communication, and media technology. For all these professorships we will have an open international announcement and it will be very important to secure and raise the basic faculty funding to be able to attract excellent candidates to maintain our position in the international forefront.

The Professorship in Numerical Analysis was established in 1963 and the present incumbent (Engquist) will retire within three years. The department has recruited several young associate professors but have a
shortage of middle-aged faculty. In numerical analysis or scientific computing we have comprehensive education at all levels and research in the international forefront. The professorship will be announced in 2011.

The Professorship in Applied Numerical Analysis was established in 1999 and the present incumbent (Johnsson) will retire within three years. The research focuses on High Performance Computing. We have employed an assistant professor in that area and a Visiting Professor in Parallel and Distributed Computing in 2009 to further develop the area. We aim to build a stronger faculty within the area and the professorship will be announced in 2011.

The Professorship in Computer Science was established in 1982 and its only incumbent (Arnborg) will retire within three years. The research in computer science has grown considerably and is today focused on three profiles, and the education includes the Degree Programme in Computer Science and Engineering and a very broad spectrum of courses. The Professorship will be announced widely within computer science no later than 2011.

The two Professors in Speech Technology (Gräström) and Speech Communication (Carlson) will retire within three years. The research has been built up over a period of more than 30 years and was summarized as world leading in the KTH Research Assessment Exercise (RAE). The plan is to announce at least two associate professorships in 2010 and to promote them to full professor in a few years.

The Professorship in Media Technology (formally in graphic arts technology) with a focus on media production was established in 1995 and the present incumbent (Enlund) will retire in spring 2011. The department of Media Technology was founded in 1985 by the current holder of the professorship and is now responsible for several programmes and extensive research activities. A second professorship in Media Technology with focus on Social Media was established in 2006. The new professorship will have a broad profile and the position will be announced in 2011.

The Professorship in Computer Science focused on Natural Science Applications was established in 2002 at Stockholm University and its only incumbent (Lansner) will retire within seven years. The aim is also to strengthen the Neural Science collaboration with KI and other national and international groups. It is critical to plan for renewal and broadly announce a professorship in Computer Science with a profile in Computational Neuroscience.

### Areas for new Professorships

**Professorship in Scientific Visualization/Perceptualization**

A professorship in visualization or the broader field of perceptualization should be created as soon as possible, to continue the work initiated in recent years under the leadership of Professor Sundblad. The aim is to offer a combined education at Master’s and doctoral level along with research into visualization/perceptualization, in order to improve the whole process from modeling to production. At KTH, we have established a center hosted by CSC for Visualization, Interaction & Collaboration (VIC), in which all of the Schools at KTH participate. We have also created a Meeting Place for Visualization in Stockholm with a national link to the universities in Norrköping and Gothenburg. To attract strong applicants we need to offer an attractive starting package.

**Professorship in Computer Security**

The School needs to strengthen the faculty in the field of security and safety, and will start to build a regional center in Stockholm with the base at KTH. Success in this area will require successful financing and recruitment both on the junior and senior levels. We view a recruitment of a professor in this area as high priority. To attract strong applicants we need to offer an attractive starting package. Therefore we need to increase the basic faculty funding.

**Professorship in HCI – Interaction Design**

The volume of activities of the HCI group at all education levels as well as the wide scope of HCI, with design as a fast growing part of the field, internationally and in our group, strongly motivates a second professorship in HCI focused on Interaction Design no later than 2011, when professor Sundblad will retire.
We list the need within the next three years:

- Speech Communication (2)
- Scientific Visualization/Perceptualization
- Computer Science (2-5) to replace after retirements; especially computer security, database technology, high performance computing and machine learning
- Numerical Analysis (2-4) to replace after retirements; one with a profile in computational biology
- In order to secure faculty resources in Media Technology, several new positions have to be established in the period. These should be focused on image and video technology, interactive mobile media, and media and arts.
- In order to plan and give new master and graduate programmes, there is a need to hire associate professors in Sound and Music Computing and Electro Acoustics.

Associate and assistant professors for the period 2010 - 2012

To secure the resources for teaching and advising we need to continue our efforts to hire young associate and assistant professors. Since 2005, we have managed to follow our plan and have attracted many competent applicants to our open positions and successfully hired both female and male professors. In the near future, we need to hire at least 10 associate or assistant professors and preferably we will have a broad announcement.

Stage Goals Research and Development in Three Years’ Time 2010-2012

- Five new professorships created/filled once more with at least one woman professor inaugurated.
- At least five associate professors promoted to professor, of whom at least two are women.
- At least five associate professors recruited, of whom at least two are women.
- At least five assistant professors recruited, of whom at least two are women.
- At least five postdoctoral research fellows, at least two of whom are women, are employed.
- For all teachers, 20% of their time is dedicated to their own development
- All teachers have teaching duties for at least 25% of their time.
- Fifty percent of all teachers are able to devote at least 25% of their time to their own research.

Stage Goals Teachers’ conditions in Three Years’ Time 2010-2012

- Create a model whereby we can introduce a sabbatical semester adapted to individual needs
- Create a model for continuous career support
- Revise the staffing model and extend it to cover all activities
- Revise the distribution of administrative duties between teachers and administrators
- Investigate how time studies can be used to support teachers’ planning
- Investigate what support systems are available locally and at other universities.
Internationalization

“...has decreased from 25% ten years ago to 10% today, which is far from our ambition of 50%. “

It is crucial for a university school to be a part of the international faculty and, as was confirmed in the KTH Research Assessment, CSC belongs to the international research forefront. We also have a long tradition of more than 20 years of exchange students within the Erasmus programme both incoming and outgoing. Students have been coming in from all over the world thanks to three international Master’s programmes in Scientific Computing (for more than 10 years), Media Management and Computational and System Biology (the last two years). We have also been active in some long-term projects to build academic competence in our areas at other universities. For 10 years our professors have been successfully strengthening Centro de Cálculo at the University in Montevideo, Uruguay and we are now giving several courses at the University of Tashkent.

Stage Goals Internationalization in Three Years’ Time 2010-2012

• **Draw up an action plan to increase student and teacher exchanges**

The number of incoming students to KTH has increased, but the fraction of KTH students studying at a partner university has decreased from 25% ten years ago to 10% today, which is far from our ambition of 50%. We need to intensify our efforts to increase the interest of the students in pursuing part of their studies at some other university. One way is to encourage our professors at all levels to inspire the students through their own experiences. During the next year, we will find models for our professors to plan for a sabbatical leave, for example, at a partner university or with a research collaborator. The School has been very successful in sending out faculty members to American colleges within the STINT scholarship program Excellence in Teaching.

The School has now appointed a special international group to draw up an action plan for the coming years.
Cooperation with Society at Large

The School’s research groups cooperate extensively with business and industry. This has been strengthened most considerably in the last 10 years through our six Centers and around 70 European projects involving cooperation with several hundred companies and organizations. To create a useful strategy it is essential to map out existing contacts.

“By increasing the cooperation between teachers and representatives of the business world, there is great potential for developing even more relevant and realistic education.”

To stimulate and motivate students and teachers, we intend to increase our contacts with various university departments and with the business community. Today these contacts take place principally through the research tasks of doctoral students and final-year students’ degree projects, major projects and guest lectures, and collaboration during the development of laboratory sessions. By increasing the cooperation between teachers and representatives of the business world, there is great potential for developing even more relevant and realistic education. Our aim is to increase these contacts by encouraging some teachers to spend a sabbatical semester at another university, school, company, or other organization. We also aim to increase experience by employing several guest lecturers from industry.

It is also essential that the results of the research and development carried on at the department can be of practical use to an even greater extent. We therefore need to intensify our contacts with the business community and society at large to achieve long term collaboration, and strengthen our information and marketing. CSC must be a well-known national resource in our area of operations where our website is an important information channel. This should contain not only information on education and research but also reference tools, demonstrations, interactive meeting places and popular science presentations giving surveys of topical problems and research areas.

“...to intensify our contacts with the business community and society at large to achieve long term collaboration, and strengthen our information and marketing.”

We already have much of the competence necessary to achieve these goals, but need to strengthen our position further by appointing a teacher responsible for these efforts and formulating a strategy in close contact with KTH Business Liaison.

Stage Goals Cooperation with the community at large in Three Years’ Time 2010-2012

- Appoint/employ someone responsible for liaison with companies/ business and industry/ the community at large
- Map out and take care of existing contacts – create a database
- Draw up an action plan to expand contacts with society at large
- Make clear the requirements in every employment profile relating to cooperation with the rest of society
Working Environment/Health and Safety

To achieve successful results in education and research requires good interaction between students, teachers and other staff. An important criterion for success is a good working environment in which students and staff alike grow and flourish. CSC wishes to strengthen and extend its work on the working environment and has appointed a working environment/health and safety group to propose measures to improve conditions for both students and staff. This group includes undergraduate students, doctoral students, teachers and administrative and technical staff.

The following factors are significant for creating a good working environment:

- clear leadership to stimulate employees toward personal development and assumption of responsibility,
- respect for the individual,
- the opportunity to assume responsibility and take initiative for improving and influencing one’s own duties,
- a working environment that is experienced as safe and secure.

The working environment must be inspected regularly and measures taken must be evaluated in order to find new means of improvement, ultimately to raise the level of personal security and well-being.

Stage Goals Working environment/Health and safety in Three Years’ Time 2010-2012

- Introduce sabbatical semesters for teachers.
- This will affect both the national and the international exchange positively.

The set goals will be achieved by

- conferring on questions of the working environment in all departments and in the collaboration group
- carrying out physical and psychosocial safety rounds in all departments and study environments
- drawing up annual action plans and evaluating the result of the work in health and safety
- establishing routines for internal safety control
- actively spreading information on health hazards
- creating a direct and open dialog on health hazards
- actively seeking ways to reduce stress for employees and students
- establishing a clear function responsible for monitoring the working environment and stress-inducing factors.

The working conditions of the teachers have changed drastically over the last 10–15 years and produced a strongly pressured and stressful environment. In the immediate future, the School will be focusing on improving these conditions and will be drawing up an action plan for how this should be accomplished. Important ingredients are introducing a sabbatical semester for teachers who wish it and providing career support, reducing administration, and improving the staffing model for the teachers.
Equal Opportunity, Diversity and Manifold

The greatest challenge facing the School is attracting more female students to our degree programmes. After considerable recruitment efforts during the second half of the 1990s, the number of female students taking the Master of Science in Engineering programme in Computer Science rose from about 15% to almost 30%. This trend altered dramatically in the “noughties” when the IT business ran into serious difficulties. In 2009 the number of women was less than 10%.

The Media Technology programme started at the end of the 1990s with few places and a high number of applicants per place, about half of whom were women. These numbers have going down (to about 20%) and up (to about 40% 2009).

We therefore need to make a serious effort to improve the attractiveness of our programmes. We believe that such efforts will attract more women and also other students who presently are not applying for our programmes. An important task is to learn about prevailing student and teacher cultures and, when necessary, work strategically toward changing them, thereby creating more attractive study environments. Another important task is to contribute to a more accurate social image of the engineer’s role. This should interest more young people in our degree programmes that lead to professions with very varied tasks in the service of humankind.

The School has set up a working group that has drawn up a policy for equal opportunity, diversity and equal treatment. It is working actively and generating ideas for different activities. In the fall of 2006 we began a campaign to raise our teachers’ awareness of gender and other differences that affect the learning situation. Ultimately we wish to create a climate where male and female students feel equally at home.

To reach the best results and give personal fairness, it is important that the make-up of the faculty reflects the community at large. During recent years, attention has been drawn to the equal opportunity aspect at universities, in particular the lack of women in higher academic positions. This is very true of CSC, even though we have a female Dean, two female professors, five female associate professors and three female assistant professors. During the present decade, several women (36) have been awarded doctoral degrees and the number of women recently admitted to research training has increased dramatically (35%). Nevertheless, it will be many more years before it is possible to significantly increase the number of female associate professors and professors. It is also important to draw attention to other skewed distribution and fairness questions. The Swedish population includes a very large number of people with foreign backgrounds, but they are not represented to the same extent in the universities, and not in the School either. An important source of recruitment is the International Master’s programmes. Students admitted to these programmes come from many different countries and different ethnic groups. After a couple of years, these students can be recruited to research education and would subsequently within ten years be possible to employ as assistant professors.
Administrative and Technical Support

The overarching goal of the administrative organization is to provide good service and information to students and the general public and good support to management and employees at CSC and KTH as well as Stockholm University. This is achieved through secure and correct management of tasks by highly capable administrators with understanding for differences in people’s background, potential and needs. The administration must be efficient and well suited to the demands and needs at the School, and inspire confidence through knowledge and competence. The administrators achieve this by cooperating and by coordinating the administrative resources. “CSC” works actively with competence development, with transference of competence, and with the well-being of employees.

The School’s administrators must take an active part in developing the administrative work, both in the School and at KTH. When new requirements, resources and support systems are developed, they must be documented in the form of new routines and distributed within the School.

In the educational administration, a series of changes will constitute new demands, particularly with regard to the tasks of seeking out students nearing completion of their studies, new and international programmes at advanced level, and the School’s ambition to increase international student and teacher exchanges. One challenge in the coming years will be to devise smooth and efficient methods for managing all of the employments that will be affected by past and future changes in labor legislation. The ambition to improve information on the Web and the School’s marketing also places new demands on administrative support.

The mission of the computer systems support is to provide students, faculty, and administrative staff with a work environment that is well matched to their computing requirements, tastes and habits. We are firmly convinced that a choice of computer platforms, rigorous and transparent security measures, and freedom from routine maintenance, best supports user creativity and productivity.

KTH strives to provide better integration, shorter time-to-market for new IT solutions, and stronger support for users that roam between different roles and workplaces. Together with colleagues at other schools we are opening the computer labs all over campus to students from all educational programmes and courses. A continuous process of evaluating goals and means for the IT environment is the key to meeting the present and future needs of CSC faculty and students.

Jointly with the University Administration, the School is planning an inventory and benchmarking of computer support during 2010 to find coordination advantages through extended coordination between different IT activities at KTH.

Stage Goals Finance in Three Years’ Time 2010-2012

• Every subject must pay its way financially, even if each individual course need not.

Stage Goals Premises in Three Years’ Time 2010-2012

• All work is done in purpose-built premises. Of the School’s total costs, the cost of premises should not exceed 12% for undergraduate education and 10% for research and research education.