H523 Department of Computer Science

Strategy

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1 Strategic framework

1.1. Operating environment and assessment of current situation

The department considers the following features to be among its strengths:

-research standard (participation in four centres of excellence, repeatedly very successful in the scientific reviews of the university)
-international students and research
-research cooperation with the industry and Aalto University
-innovative teaching and active improvement of the instruction (national centre of excellence in university education)
-the number of BSc degrees
-employment rate among students/alumni
-the sense of communality and good working atmosphere of the department, among the best at the university.
Weaknesses include the relatively small number of completed Master and Doctoral degrees compared to the number of accepted postgraduates; the drawn-out degree completion times; the imbalance between teaching load and research activity; external research funding has plateaued; the aging of teaching staff (however, the professoriate has been renewed lately and this development continues); and the poor visibility of the department in the school system.

Among the external threats to the department, the foremost one is the weakening status of the ICT industry in Finland and Europe, and the general financial crisis. This may reduce the relevance of the discipline for students and curtail financing. However, for the time being, the employment situation is very good, and interest in the subject is on the rise.
It is challenging to keep up with the rapid developments in the field, as the establishment of new specialisation areas through recruitment is limited. The considerable amount of result-based backing that the department has been receiving will end during this planning period.
Among the opportunities, let us mention active international recruitment; the diverse utilisation of different funding sources; adding to the number of principal investigators (especially professors); and raising the department profile in schools with the help of new open web courses, and thereby gaining better and more committed students.

The department's strategy map and plan of action is based on the analysis of the current state of the department presented above.

1.2. Mission

The department is an internationally significant unit. It carries out top research in its focus areas, basing its education on them both at the Master's and Doctoral level, nationally and internationally. The focus areas are machine learning and algorithms, data networks and services, and software systems. The department also carries out research and quality instruction in such areas outside its focus areas that are socially or economically significant.
The degrees conferred by the department keep a high standard and are socially relevant, and our graduates are employed in challenging posts.

1.3. Strategic objectives and development areas

VISION FOR 2020
Excellence for society

...is the best computer science department in the Nordic countries

- Dynamic recruitment, the best students and employees
- Top research crossing discipline and structural borders *
- Demanding, dynamic and supported learning and instruction *
- Planned risk-taking in research *

...impacts the technological development of society

- Strengthening active collaborations and networks
- Research findings and knowledge released to society *

...is an international and inspiring community that students commit to

- Time for research and teaching through functioning structures and processes *
- Careful staff planning

...builds its finances on a stable foundation.

- Long-term management of finances independently of funding sources
- Increasing external backing *

*) the unit's own goal

1.4. Profiles and focus areas

The department has profiled itself in three main areas:

1. machine learning and algorithms
2. data networks and services
3. software systems

In research, the following key areas will be emphasized in the 2013-2016 period:

-data security

- development of software systems, coaching developers, and software measurement (FiDiPro Professor Jürgen Münch)
-computational creativity
-algorithms theory and new computation paradigms
-neuro-informatics
-ubiquitous computing and interactive technologies
-'Big Data'
The research focuses on the key areas and research units and project groups that are large enough.

The degrees and teaching offered by the department keep a high standard and are socially relevant. The Bachelor's degree forms a basis for the Master's education while giving sufficient skills to work in the field for those who do not continue to the Master's programme. The Master's and Doctoral education is based on the research carried out at the department and its key areas. The instruction has been profiled around the focus areas of the department, which makes it internationally appealing. The research at the department combines theory and interaction with companies and the application fields. Graduates from the department find employment in challenging jobs.

The administration and IT teams at the department give the research and teaching dynamic support. The work atmosphere at the department is among the best at the university. The work is developed communally and the wellbeing of employees a point of investment.

The role of HIIT as a shared research environment between the department and Aalto University is noteworthy.

1.5   Quality management

The quality system supports attaining the goals set for research, instruction, social interaction, and other actions in the action plan. The realisation of these goals is monitored in the ERP process with the help of reporting and feedback from departments. The methods and responsibilities of quality management at the department have been documented in the quality manuals. In the department's quality manual, quality management has been described in the chapter Quality assurance system.

The chair of the department is responsible for the quality of the work and results of the Department of Computer Science. The director of HIIT is responsible for the quality of the work and results of HIIT. The quality liaison at each department coordinates the quality management in their own unit.
Each employee and student in a department is responsible for the quality of their own work and results, as well as their development as teachers, researchers, students, and administrators and support staff.

1.6   Risk assessment and management

Reduced finances

The status of centre of excellence in university education ending and the changed reward rules for research evaluation will reduce the department's result-based funding by c. 400,00 Euros. We will need a raising of the allocated funds and more contested external funding.

Probability: High   Impact: High

New postgraduate school system

The department has been fairly successful in utilising the current graduate school system. The system that is being established to replace it may bring with it the loss of good practises and a decrease of resources.

Probability: Medium   Impact: Large

Research opportunities and success of recruitment especially in the software systems sub-programme

The sub-programme of software systems runs the most intensive teaching schedule, while its research work is not optimal due to staff changes, among other things.

Probability: Medium   Impact: Medium

Problems with the internationalisation of teaching

The department has internationalised its teaching forcefully, and accepts a significant number of foreign students to its Master's programmes. However, the standard of the international students is very varied. The student selection process needs work, and the department should assess its success in international teaching on the basis of experiences so far.

Probability: Medium   Impact: Medium

Students entering the job market at an early stage

In computer science, this risk has traditionally been realised widely; most of our students find employment by their second year, which leads to longer times to complete the degree or even dropping out completely, and weaker studying intensity. It is important for the students to commit to their studies from the start, and the department has developed and is further improving means to ensure the commitment of students. The legislation on limiting the time span of degree work will also improve the situation.

Probability: High   Impact: Small

Turbulence in the ICT field (Nokia and globally) and the Euro crisis

The turbulence in the ICT field (Nokia and globally) and the Euro crisis may cause a dip in funding along with less national meaning for computer science and less interest in the field among young people.
So far, this threat has not come true, but computer science still attracts students and the employment situation is good. However, the turbulence in society still continues and there may be repercussions for the department in the long run.

Probability: Medium   Impact: High

1.7 Special national duties, international and academic responsibilities, network coordination

International Master's Programme in Bioinformatics, MBI

Starting date
End date
Resources Department funding
Description
International Master's Programme in Bioinformatics, MBI: a Master's programmed shared by two universities (UH, Aalto) and four faculties (Science, Medicine, Biosciences, Agriculture and Forestry) and coordinated by the Department of Computer Science.

Helsinki Institute for Information Technology HIIT

Starting date

End date

Resources Centralised backing

Description

Helsinki Institute for Information Technology HIIT: a research institution shared by UH and Aalto with its UH operations located at the department.

Finnish Academy Centre of Excellence Algodan

Starting date

End date

Resources External funding

Description

The Finnish Academy Centre of Excellence Algodan (UH, Aalto), managed and mainly operational at the department.

Helsinki Graduate School in Computer Science and Engineering, Hecse

Starting date

End date

Resources External funding

Description

Helsinki Graduate School in Computer Science and Engineering Hecse (UH, Aalto University), coordinated by the department.

In addition, the department has seats in the following graduate schools: FICS, FIGS and SoSE.

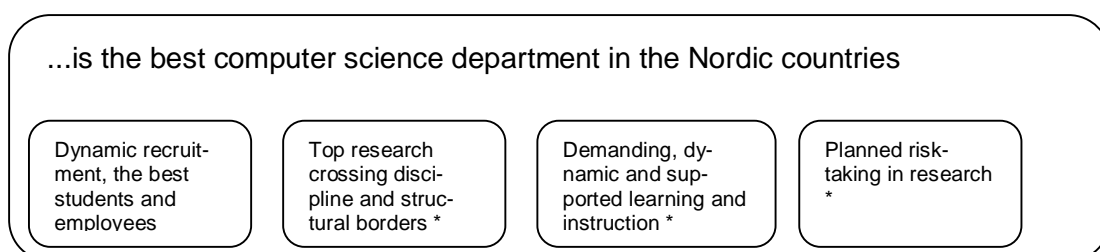Coordination of two ICT-SHOK research programmes

Starting date

End date

Resources External funding

Description

Academic coordination of two ICT-SHOK research programmes (Professor Petri Myllymäki, Professor Sasu Tarkoma)

2 Implementation of the target programme

...is the best computer science department in the Nordic countries

| Dynamic recruitment, the best students and employees | Top research crossing discipline and structural borders * | Demanding, dynamic and supported learning and instruction * | Planned risk-taking in research * |

*) the unit's own goal

2.1 is the best computer science department in the Nordic countries

The Department of Computer Science is ranked at 101-150 in the Computer Science category of QS World University Rankings 2012. The other Nordic departments in the same category are:

Chalmers, Copenhagen, Lund and Uppsala. The Nordic departments Aarhus and KTH are ranked over our department, in category 51-100.

The values for indicators AR, ER and CPP are (57, 72.5, 74.7) for our department, while Aarhus gained (61.1, 73.3, 75.7) and KTH (63.3, 77.9, 66.9). This means that we have the most to gain in the AR indicator (Academic Reputation).

2.1.1. Dynamic recruitment - the best students and employees

A1.1: Make an extensive analysis of the impact of student selection (especially MOOC) on study progress.

A1.2: The Linkki centre at the department is actively working to make computer science known among young people.

A1.3: Sufficient basic education among foreign students

The recruitment of international students will be developed to ensure that the education basis of selected students is sufficient.

A1.4: The international programmes of the department will be assessed.

The progress so far of students accepted to the international Master programmes in 2010 will be analysed, and the success of the department's international operations will be assessed on the basis of that in order to make any necessary changes.

A1.5: The international visibility for international recruitment will be improved and the use of the tenure-track process extended.

2.1.2. Top research crossing discipline and structural borders

A2.1: Participation in several centres of excellence outside the department

A2.2: Active participation in the FiDiPro programme

A2.3: Active participation in SHOK programmes

A2.4: Active participation in HIIT programmes

A2.5: Multidisciplinary research collaboration between UH and Aalto University

The strong tradition of multidisciplinary collaboration continues at the department. Current cooperation fields include bioinformatics, neuro-informatics, HCI, linguistics, behavioural sciences, computational creativity, and physics.

A2.6: ICT support for research at the department

We will study whether it will be possible to direct the resources of the department's own IT unit for the use of the research groups.

A2.7: Improving the research infrastructure: updating the cluster

The big server cluster of the department will be updated. Implementation in 2014. Cost: 700,000€.
NB: Strategic project

A2.8: Improving the research infrastructure: updating the storage architecture

The purpose is to design and implement an architecture based on virtualisation, which is flexibly scalable.
This is an expensive project that will be carried out in cooperation with HIIT and possibly other UH and Aalto departments.
Start-up cost around 300,000€. NB: Strategic project

2.1.3. Demanding, dynamic and supported learning and instruction
A3.1: Teaching arrangements for the first autumn of studies

The department has developed the teaching arrangements for the first year of studies towards activating students and make them more committed.
Extra investment in this area continues (the so-called workshop model with its apprentice system, MOOC and the TestMyCode server).
The effects are followed up regularly.

A3.2: Monitoring the teaching arrangements and the suitability of instruction.

The suitability of teaching arrangements, i.e. support for learning, is constantly being improved, but we will also start to monitor the pertinence of instruction. With the help of data obtained from Oodi, we will analyse the bottlenecks of the learning path, and how the instructors have succeeded in different courses.

A3.3: More cooperation within the campus and between national and international networks.

2.1.4. Planned risk-taking in research

A4.1: Dynamic recognition of new and promising research topics

New and promising research topics and researchers will be identified dynamically and research resources will be directed to them from the department funds.
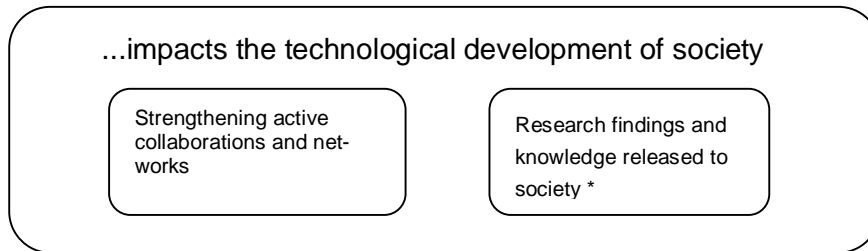
A4.2: When possible, top researchers from outside the focus areas will be recruited.

In accordance with this policy, the department will start instruction and research in data security in the academic year 2012-2013 by recruiting an experienced senior researcher from outside the department.

A4.3: Active follow-up of the research field and updating of research programmes

2. Implementation of the target programme

...impacts the technological development of society

Strengthening active collaborations and net-works

Research findings and knowledge released to society *

*) the unit's own goal

2.2. . . . impacts the technological development of society

2.2.1. Strengthening active collaborations and networks

B1.1: Consolidate the work of the Linkki centre working under LUMA

LUMA needs a coordinator working 20-40% part-time.

B1.2: Organise retreats for corporate collaboration partners in connection with the SHOK pro-grammes.

2.2.2. Research findings and skills benefitting society

B2.1: Develop the mechanisms for distributing and advertising research findings to corporate partners and other target groups.
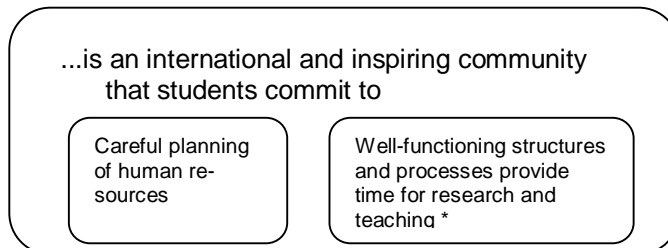
Establish a bank of research findings at the department (a software and data portal). Improve corporate cooperation through e.g. retreats. Activate participation in public discourse on the ICT field.

B2.2. Activate and support start-up enterprising at the department.

The objective is to promote an enterprising atmosphere, especially among undergraduates (teaching in cooperation with HIS).

2 Implementation of the target programme

> ...is an international and inspiring community that students commit to
>
> > Careful planning of human resources
>
> > Well-functioning structures and processes provide time for research and teaching *

*) the unit's own goal

2.3. . . .is an international and inspiring community that students commit to.

2.3.1. Careful planning of human resources

A human resources plan is drawn up at the department to define the changes to be made to the structure of staff employed on allocated funds during the planning period . The heads of research units and projects are in charge of the HR plans for their own units.

Over 200 employees work at the department annually (c. 150 person-years). Around half of the person-years are completed on external funding. In addition, a significant number of part-time teachers work at the department. Over 20% of the employees are foreigners.

C1.1: An HR plan will be drawn up at the department to be followed and revised annually or when the need arises.

C1.2: The use of the tenure-track process will be extended.

C1.3: Employment contracts will last whole projects or degree programmes

Employment contracts will be made for the duration of projects as much as possible, and for the duration of the degree work for postgraduates.

C1.4: More post-docs and postgrads, less research assistants
C1.5: International, active recruitment, faster recruitment processes
C1.6: Equality will be considered in HR planning.

2.1.1 2.3.2. Well-functioning structures and processes provide time for research and teaching

C2.1: Regularising the system with research periods.

Make sure that employees with teaching-intensive duties also have time for research periods. Research periods are broadly considered time periods suited for improving your own skill set.

C2.2: The productivity of instruction (cost-benefit) will be analysed.

The productivity of instruction (cost-benefit) will be analysed. The results will be utilised for organising teaching and allocating teaching duties.

C2.3: Students will commit to their studies when given responsibility.

In teaching, this will be attained through an apprentice system; in research, through research group novices. Continue providing suitable outside activities as part of the degree work (e.g. HS Open and other open competitions).

C2.4: The administrative work processes will be revised and the rules of procedure at the department updated.
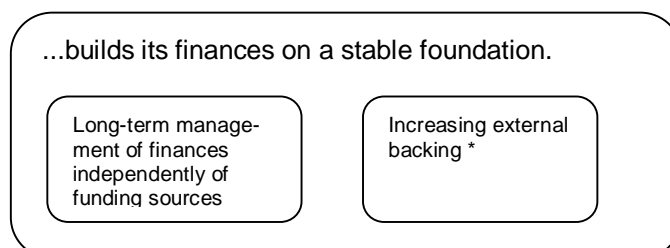
C2.5: Tools for governing education and assessing results

The technical support will be improved for better teaching arrangements and learning results. Three sub-projects: A. In order to support the governing of education, a system for monitoring learning paths and the impact of teaching will be implemented. B. The use of massively open online courses (MOOC) will be integrated as a fully functional part of traditional university instruction. C. A tool for assessment and self-evaluation of accumulated skills will be implemented. NB: Strategic project

C2.6: The progressive campus: enhancing instruction and research through ubiquitous computing

The objective of the project is to promote more extensive use of ICT on the whole campus to enhance both instruction and research. Enforce the high-tech image of Kumpula. NB: Strategic project

2 Implementation of the target programme

...builds its finances on a stable foundation.

Long-term management of finances independently of funding sources

Increasing external backing *

*) the unit's own goal

2.4. ... builds its finances on a stable foundation.

2.4.1. Long-term management of finances independently of funding sources

D1.1: Using project surpluses and the balance of the department to even out the funding of research groups

A common set of rules to be worked out.

D1.2: Expanding the external funding base.

We will strive to expand the external funding base (SA, Tekes, EU, as well as direct corporate backing, foundations, ministries, etc.).

2.4.2. Increasing external backing

D2.1: The objective is to gain 50% of the department budget from external financiers.

D2.2: As project funding increases, the department will hire more staff for research coordination.

The networks sub-programme has an immediate need for a research coordinator on external funding.

D2.3: Increasing the number of professors

3.2 Facilities plan

The department work spaces are used effectively and the number of workstations seems to be appropriate for the long term. Some rearrangements will be necessary during the planning period.

In summer, there is a shortage of workstations due to the large number of summer employees. In the coming planning period, the growing research groups (on external funding) of the new professors will increase the need for work spaces, as well as a need to reorganise existing spaces to support the work of the research groups better. On the other hand, there are many workstations that have been reserved for part-time employees and visitors, who do not use their workstations daily.
 How to reorganise the workstations will be considered during the planning period. Among the things to consider is changing a classroom or meeting room into a 'landscape office' where there are no dedicated workstations but all the workstations are used communally.

Teaching spaces are mostly used effectively. However, the workshop classrooms are not utilised fully, and their purpose could be reconsidered. They could e.g. be offered as temporary workspaces for researchers.

4.3. Responsibilities and roles in follow-up and reporting

The head of the department is responsible for the implementation, follow-up and evaluation of the action plan. The realisation of the action plan will be assessed annually by the faculty and the department. The follow-up is based on the qualitative reporting of the unit and the use of indicators. The dean / head report to the rector on the implementation of the strategy. The dean / head discusses the attaining of objectives with the concerned parties in the unit.