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ELEC Strategic action plan 2017 - 2020

The ELEC Strategic action plan is based on the Aalto University Vision, Mission and Strategy for 2016-2020. This strategy updates the earlier Aalto strategy for 2010-2015 and is a result of a substantial effort by the whole community. Thus, ELEC will not have its own specific strategy but instead, a strategic action plan has been created for the execution of Aalto strategy in ELEC.

Roadmap in nutshell and target state in 2020

The ELEC roadmap towards 2020 in nutshell is presented in Fig. 1 below. Our ultimate goal is to consolidate our position among the 20 best electrical engineering schools in Europe by 2020. In Nordic our aim is to be one of the best electrical engineering schools. Following the framework given by Aalto strategic objectives and development actions we have formulated three main objectives for research and innovation and education in ELEC. In addition, objectives for creative practices and enablers have been briefly stated.

Figure 1: The ELEC strategic roadmap towards 2020 in a nutshell

Aalto strategy spans over four main dimensions: excellence, multidisciplinarity, entrepreneurship and societal impact. Our target state with respect to these dimensions in 2020 is the following:

Excellence:
• In terms of publication KPI’s ELEC is among the best 20 electrical engineering schools in Europe and one of the best in Nordic.
• Our solid academic culture and world-class research infrastructures provide a highly competitive research environment that attracts international top level researchers and support us in recruitment of best professor candidates.
• The fraction of internationally highly competitive doctoral level researchers among academic staff is clearly larger than in 2016 and our full-time doctoral students graduate in 4 years.
• Research excellence is enabled by constant success in gaining competitive research funding.
• We are renowned for our workshop courses utilizing experimental learning and challenge for innovation.

**Multidisciplinarity:**
• We are strong contributors in Aalto research platforms and we have credible incentives for our professors to conduct multidisciplinary research across department, school and discipline borders.
• Collaborative use of our infrastructures with industry, other schools and between disciplines is usual; the effective use of infrastructures is ensured by professional technical staff that works across the organizational borders.
• Our students actively participate in the cross-school multidisciplinary MSc programs.
• We actively organize multidisciplinary project-work courses and workshops in collaboration with other Aalto schools.

**Entrepreneurship:**
• We are a key contributor in the innovation ecosystem through our research, student projects and our infrastructure.
• We have established ways of supporting staff and students in the early phases of starting their companies and offer them the possibility of conducting experimental science/challenge based entrepreneurship
• We systematically encourage our researchers and students to commercialize their ideas, provide support in case of risk taking and celebrate entrepreneurial achievements.
• All our students are exposed to entrepreneurship education.

**Societal impact:**
• We encourage and systematically support industry collaboration.
• Cooperation with most important non-academic partners is continuous and systematically driven by the management.
• The relevance of our educational programs for the society is assured by regular dialogues with our industrial partners.
• Industry partner spectrum is wide and contains large number of SME’s.
• Our alumni serve in key positions in industry and society.

**Key development actions**

**Research focus areas 2017-2020**

**Number of professors:** Due to very challenging financial situation it is foreseen by the university management that the number of tenure track professor slots will not increase 2017-2020. As a result, changing the numbers of professors in different focus areas may happen only by redirecting professor positions when retirements take place. In ELEC we expect 2-4 retirements by 2020 and proactive measures has been started to avoid drop in number of professors.

**Current research focus:** We are very competitive on three areas: ICT, Advanced Energy Solutions and Materials and sustainable use of natural resources, see Table 1.

In *Health and Wellbeing* (H&W) the research community is small and cooperation over department and school borders is very important. Also collaboration with University of
Helsinki and Helsinki University Hospital is of vital importance. The role of Aalto platform is central in promoting the collaboration between different organizations. In 2017 one tenure track professor will be recruited to H&W but, on the other hand, one professor may retire within few years. The complementary Professor of Practice (PoP) position maybe opened to further develop education and industry collaboration on the area.

*Information and Communication Technologies* (ICT) is currently the strongest focus area in terms of professor volume and no further growth in the number of positions is planned by 2020. Reconfiguration of positions freed through retirements is possible such that e.g. H&W or energy related applications of ICT are emphasized. Also the importance of Industrial Internet is noted and accordingly a PoP position will be filled in 2017.

In *Advanced Energy Solutions* are there is a need for the position in renewable energy in electric power networks. Accordingly a tenure track position in the field will be opened in 2017. On the other hand, there will be one retirement taking place in the corresponding department within few years.

In *Materials and sustainable use of natural resources*, there was one tenure track position opened in 2016 and filling process is ongoing. In addition, the applications of material science on areas like H&W or energy production/distribution is field of interest. Yet, in current financial situation it is merely a long-term plan to increase strength on this focus area.

No growth is expected on complementary areas or in Human-centered living environments. However, it is noted that in latter, the borderline of the focus area is not very clear and there is research on ICT and lighting technology that could be counted on this focus area.

<table>
<thead>
<tr>
<th>Professors on Tenure Track</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human-centered living environments</td>
<td>1</td>
</tr>
<tr>
<td>Advanced energy solutions</td>
<td>9</td>
</tr>
<tr>
<td>Health and wellbeing</td>
<td>4</td>
</tr>
<tr>
<td>ICT and digitalisation</td>
<td>27</td>
</tr>
<tr>
<td>Materials and sustainable use of natural resources</td>
<td>8</td>
</tr>
<tr>
<td>Complementary areas</td>
<td>7,4</td>
</tr>
<tr>
<td>Total</td>
<td>56,4</td>
</tr>
</tbody>
</table>

*Table 1.* ELEC research focus areas and numbers of professors in 2016.

**Action plan: Measures already taken during 2015-2016**

The current dean took office in August 2015. The following major actions have been carried out after that:

1) Strategic deselections
   - Related to national profiling actions, the High Voltage Laboratory was closed and research on the area has been in main parts discontinued. The facility has been rented out to industry.
   - Due to diminishing research activities in the field, the ELEC airplane was sold and related research work was discontinued.
2) Structural changes
   - Project for the merger of two departments (Dept. of Micro- and nanosciences, Dept. of Radio Sciences) was established. New department starting date was 1.1.2017.
3) Statutory negotiations executed in Aalto to reduce the operative costs on a sustainable level after MEC funding cuts. Fortunately, the headcount reduction in ELEC was small.
4) ELEC relocation project was launched. This is a major effort moving over 400 members of the ELEC community and all research infrastructures of Otakaari 5 to new locations and the move will be complete in the first half of 2017.

Action plan for 2017-2020: Research

Action plan is given in terms of targets and related actions. Due to readability there is only general level description for actions. For most of the actions detailed description with timelines occurs and is shared with responsible persons.

**Target:** Increase the fraction of high quality publications and the number of excellence recognitions like Academy of Finland Centre of Excellence, ERC grants and other notable recognitions.

**Actions:** Dean promotes high ambition level especially among young professors through yearly personal review of professors on early stage of their tenure track. Dean also carries out annual discussions with tenured professor to better identify the needs for support. To promote high quality publishing work we increase the number of visiting/adjunct professors, research fellows and postdocs. In addition we aim to recruit only the most promising doctoral students. We keep the strong incentive in the new department funding model for the publications in high quality venues and we allocate additional resources for research groups obtaining Centre of Excellence status and professors/researchers obtaining ERC grant or other notable personal grants. Finally, we further develop ways of rewarding and recognizing achievements of our staff.

**Target:** Decrease the study times of doctoral students but sustain the high quality of doctoral education.

**Actions:** We limit the financial support of doctoral students up to 5 years. But, on the other hand, we allow a postdoc period for those students who graduate within 4 years. Yet, the duration of the funding period including doctoral studies and postdoc period is limited to 6 years. We renew the doctoral education culture by applying international benchmarks.

**Target:** Maintain and develop ELEC research infrastructures. Ensure high quality technical support services.

**Remark:** Nanofab and Metsähovi will be considered separately.

**Actions:** From 2017 onwards we execute calls for new infrastructure investment 3 times per year and we carry out annual infrastructure reviews to keep the needs updated and to ensure feasible scheduling of investments. We ensure continuous investment capability by keeping
the infrastructure depreciations on 4-6% level with respect to the income budget. We ensure effective joint use of infrastructures over department and school borders, and merge infrastructures providing the same services. We reorganize technical services to enable more effective sharing of technical staff resources.

**Target:** Strengthen and promote multidisciplinary research.

**Actions:** We ensure strong ELEC contribution in the Aalto platforms that coordinate the work in the research focus areas. The ELEC contribution on different platforms is depicted in Fig.2.

**Figure 2.** Aalto platforms and related ELEC contribution

Furthermore, we develop professor level incentives for multidisciplinary research within Aalto and especially with international world-class partners. We also promote infrastructure development and technical support to cater multidisciplinary needs.

**Action plan 2017-2020: Education**

**Target:** Ensure the study programme attractiveness

**Actions:** We expose our students to entrepreneurship education and further develop the renowned workshop courses utilizing experimental learning that also encourage innovation. ELEC students participate actively in cross-school multidisciplinary MSc programs. We ensure that our MSc students have opportunities to participate in complex educational research projects (e.g. nanosatellites etc). We promote ELEC educational projects in social media and we systematically involve ELEC’s international Alumni to MSc programs marketing.
**Target:** Adopt and develop effective e-learning solutions

**Actions:** We increase the number of courses including e-learning and online education year-by-year and we create parallel e-version for number of courses to facilitate summer studies and to enable fast progress of students. We deploy digital exams as part of the evaluation. We promote co-teaching in learning workshops to strengthen interpersonal collaboration and to facilitate more effective learning. We integrate education of ICT and other study capability skills into 1st year curriculum ensuring fluent start of studies.

**Target:** Success of students is clearly improved

**Actions:** Study credits and workload are made to match in all curricula. BSc and MSc Curricula are streamlined if necessary. Study schedules are created to support students’ time management. Students’ study planning support and guidance is designed to meet students’ expectations. Study skills education will be integrated into curriculum and the number of lectures per course will be diminished. Systematic student well-being surveys will be carried out annually to identify development areas and opportunities for improvement.

**Target:** Student working life competences will be clearly improved

**Actions:** Project-work courses and workshops will be widely offered in ELEC’s curricula. Collaboration with companies in education and curriculum planning is made regular. Summer training is systematically supported and supervised as a normal study attainment. Working life skills is made an essential part of the curriculum.

**Action plan 2017-2020: Art creativity and design**

**Target:** Promote art, creativity and design in ELEC

**Actions:** We offer the space and opportunity for artistic activity in different ELEC locations and create an atmosphere where art and technology meet. We encourage our students to develop their industrial design competences by taking courses offered by ARTS and we integrate creative practices and design thinking into our hands-on courses. We host Artist in Residence in ELEC to promote grass-root collaboration between engineering researchers, students and artists.

**Action plan 2017-2020: Societal impact and entrepreneurship**

**Target:** Consolidate strong partnering culture with industry.

**Actions:** We enlarge the span of industry partner spectrum to contain also a number of SME’s and we cooperate with main strategic partners systematically and continuously in research and education. We assure the societal relevance of ELEC educational programs through
regular dialogue with our industrial partners. We further develop alumni activities.

**Target:** Establish the entrepreneurship culture in ELEC.

**Actions:** We identify, establish and promote best ways to support staff and student spin-offs and we offer them the possibility of conducting experimental science/challenge based entrepreneurship. We systematically encourage our researchers and students to commercialize their ideas, provide support in case of risk taking and celebrate entrepreneurial achievements. We expose all ELEC students to entrepreneurship education.

**Action plan 2017-2020: Enablers**

**Target:** Secure a feasible level of funding.

**Actions:** We secure Academy, EU and corporate funding. What comes to Academy of Finland, we keep and improve the current success rate of applications. In EU domain the focus is on ERC and framework funding what we use to compensate for the substantially declining TEKES –funding. We intensify collaboration with industry partners and we introduce strong professor level incentive in the school funding model.

**Target:** Ensure professional and effective services supporting academic excellence

**Actions:** We develop actions to further improve the wellbeing of service staff. We practice Lean services and administration and adopt digital tools to increase efficiency of services. We take measures to distribute the workload of service staff more equally over school and departmental borders and thereby keep the organization effective and at an appropriate size. We practice cautious recruitment policy in regards to opening compensatory positions.

**Target:** The facility cost savings in 2020 compared to 2016 is at least 30% and the estimated decline in facility space in 2020 compared to 2016 is notable. At the same time new facilities serve clearly better research, education and services.

**Actions:** ELEC will execute a major staff and infrastructure relocation in 2017. Accordingly, we will radically reduce office space and reduce the amount of laboratory space and encourage common use of infrastructures among departments.