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NATIONELLA CENTRET FÖR UTBILDNINGSUTVÄRDERING
FINNISH EDUCATION EVALUATION CENTRE

AUDIT OF THE LAPPEENRANTA–LAHTI UNIVERSITY OF TECHNOLOGY LUT

Tekijät **Håkan Wiklund, Irina Duma, Birgit Kraus, Matti Kuronen & Mirella Nordblad. Annikka Nurkka (ed.) Self-assessment of LUT.**
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Audit of the Lappeenranta–Lahti University of Technology LUT

Abstract

- Auditointiryhmän arvio

Title of publication

Audit of the Lappeenranta-Lahti University of Technology LUT

Authors

Håkan Wiklund, Irina Duma, Birgit Kraus, Matti Kuronen & Mirella Nordblad. Annikka Nurkka (ed.) Self-assessment of LUT.

Higher Education Evaluation Committee’s decision

The Lappeenranta-Lahti University of Technology LUT passed the audit on 16 June 2021.

The Quality Label is valid until 16 June 2027.

Audit team’s evaluation of the evaluation areas I-III

I: HEI creates competence: good level

II: HEI promotes impact and renewal: excellent level

III: HEI enhances quality and well-being: excellent level

HEI as a learning organisation – evaluation area chosen by LUT

Digitalisation in teaching and learning

Theme and partner for benchlearning

Theme: Master’s thesis in engineering programmes at PoliMi

Partner: Polytechnic University of Milan

Key strengths and recommendations

Strengths

- Education at Lappeenranta-Lahti University of Technology systematically reflects the university’s strategy.

- LUT has strongly strategy-based, systematic and consistent management and improvement of its societal engagement and impact. LUT systematically collects information from its operational environment and monitors key performance and strategic indicators, and uses the information to redirect its activities.
- LUT's quality system is well-designed and communicated and covers the institution's core duties.
- The whole university community acknowledges the benefits of digital tools and there are, especially among teaching staff, clear ideas and plans to maximise their potential.

Recommendations

- The university should continue to work to improve the role of course evaluations in their quality system.
- LUT could benefit from ensuring that research ethics are considered as precautionary measures and are introduced in the early stages of both research planning and the researcher career.
- The quality work at LUT can benefit from increasing the systematic dissemination of good examples to all parts of the university.
- The university should find a balance between online and on-site teaching and learning, while taking further steps to bring social interaction into the digitalised process.

Tiivistelmä

- Auditointiryhmän arvio

Julkaisun nimi

Lappeenrannan-Lahden teknillisen yliopiston auditointi (Audit of the Lappeenranta-Lahti University of Technology LUT)

Tekijät

Håkan Wiklund, Irina Duma, Birgit Kraus, Matti Kuronen & Mirella Nordblad. Annikka Nurkka (toim.) LUT-yliopiston itsearviointi.

Korkeakoulujen arviointijaoston päätös

Lappeenrannan-Lahden teknillisen yliopiston auditointi on hyväksytty 16.6.2021.

Laatuleima on voimassa 16.6.2027 asti.

Auditointiryhmän arvio arviointialueista I-III

I: Osaamista luova korkeakoulu: hyvä taso

II: Vaikuttava ja uudistava korkeakoulu: erinomainen taso

III: Kehittyvä ja hyvinvoiva korkeakoulu: erinomainen taso

Oppiva korkeakoulu – LUTin valitsema arviointialue

Digitalisaatio opetuksessa ja oppimisessa

Vertaisoppimisen teema ja kumppani

Teema: Master’s thesis in engineering programmes at PoliMi

Kumppani: Polytechnic University of Milan

Keskeiset vahvuudet ja kehittämissuositukset

Vahvuudet

- Lappeenrannan–Lahden teknillisen yliopiston koulutus on kytketty systemaattisesti

yliopiston strategiaan.

- Yliopiston yhteiskunnallista vuorovaikutusta ja vaikuttavuutta johdetaan ja kehitetään strategialähtöisesti, systemaattisesti ja johdonmukaisesti. LUT kerää järjestelmällisesti tietoa toimintaympäristöstään, seuraa keskeisiä suorituskyky- ja strategisia mittareita sekä hyödyntää saamaansa tietoa toimintansa uudelleensuuntaamisessa.
- LUTin laatujärjestelmä on hyvin suunniteltu, kattaa yliopiston perustehtävät ja siitä tiedotetaan myös hyvin.
- Koko yliopistoyhteisö tunnistaa digitaalisten työkalujen hyödyt, ja erityisesti opetushenkilöstöllä on selkeitä ideoita ja suunnitelmia niiden potentiaalin maksimoimiseksi.

Kehittämissuositukset

- LUTin tulee edelleen parantaa opintojaksopalautteen roolia laatujärjestelmässään.
- LUT hyötyisi ennakoivammasta lähestymistavasta tutkimusetiikassa ja sen integroinnista varhaisessa vaiheessa sekä tutkimuksen suunnitteluun että tutkijanuran alkuvaiheeseen.
- LUTin laatutyötä vahvistaisi hyvien esimerkkien levittäminen vielä systemaattisemmin koko yliopistossa.
- LUTin tulee löytää tasapaino verkko- ja lähiopetuksen ja oppimisen välille ja jatkettava sosiaalisen vuorovaikutuksen vahvistamista digitaalisissa prosesseissa.

Sammandrag

- Auditointiryhmän arvio

Publikationens namn

Auditering av Villmanstrand-Lahtis tekniska universitet (Audit of the Lappeenranta-Lahti University of Technology LUT)

Författare

Håkan Wiklund, Irina Duma, Birgit Kraus, Matti Kuronen & Mirella Nordblad. Annikka Nurkka (ed.) LUT-universitetets självvärdering.

Beslutet av sektionen för utvärdering av högskolorna

Auditeringen av Villmanstrand-Lahtis tekniska universitet godkändes den 16 juni 2021.

Kvalitetsstämpeln är i kraft till och med den 16 juni 2027.

Auditeringsgruppens omdöme för utvärderingsområdena I-III

I: En kompetensskapande högskola: god nivå

II: En nyskapande högskola med genomslagskraft: utmärkt nivå

III: En utvecklingsorienterad och välmående högskola: utmärkt nivå

En lärande högskola, utvärderingsområdet som LUT valde

Digitalisering i undervisning och lärande

Tema och partner för kollegialt lärande

Tema: Master’s thesis in engineering programmes at PoliMi

Partner: Polytechnic University of Milan

Centrala styrkor och rekommendationer

Styrkor

- Utbildningen vid Villmanstrand-Lahtis tekniska universitet LUT är starkt kopplad till

universitetets strategi.

- LUT:s samverkan och verksamhetens genomslag i samhället styrs och utvecklas på ett systematiskt och konsekvent sätt och med en tydlig koppling till strategin. LUT samlar systematiskt in information från sin omvärld, följer upp nyckeltal och strategiska indikatorer och använder informationen för inriktning av sin verksamhet.
- LUT:s kvalitetssystem är väl utformat och kommunicerat och omfattar universitetets grundläggande uppgifter.
- Hela universitetsgemenskapet ser fördelarna med digitala verktyg och det finns, särskilt bland lärare, tydliga idéer och planer för att maximera deras potential.

Rekommendationer

- LUT bör fortsätta sitt arbete för att förbättra kursutvärderingarnas roll i kvalitetssystemet.
- LUT kan dra nytta av att säkerställa att forskningsetik betraktas som försiktighetsåtgärd och integreras i ett tidigt skede i planering av forskning och forskarkarriär.
- Kvalitetsarbetet vid universitetet kan dra nytta av att systematiskt öka spridningen av goda exempel på alla delar av universitetet.
- LUT bör hitta en balans mellan när- och nätbaserad undervisning och lärande och samtidigt ta ytterligare steg för att främja social växelverkan i de digitaliserade processerna.

The premise and implementation of the audit

- Auditointiryhmän arvio

The work of the Finnish Education Evaluation Centre (FINEEC) is based on the principle of enhancement-led evaluation and producing impactful information, which contributes to the enhancement of education.

The purpose of the audit framework is

- to evaluate whether the quality work in the HEI meets the European quality assurance standards,
- to assess whether the quality system produces relevant information for the implementation of the strategy and the continuous development of the HEI's activities, and whether it results in effective enhancement activities,
- to encourage internationalisation, experimenting and a creative atmosphere at HEIs, and
- to accumulate open and transparent information on quality work at Finnish HEIs.

The principles of the audit framework are described in the audit manual.

The implementation of the audit

The four-member audit team carried out the audit. The members of the audit team were:

- Professor **Håkan Wiklund**, deputy vice-chancellor Mid Sweden University (chair)
- Doctoral student **Irina Duma**, Technical University of Cluj-Napoca
- Quality manager **Birgit Kraus**, Aschaffenburg University of Applied Sciences
- Region manager, DSc **Matti Kuronen**, , Bonava Suomi Oy.

Mirella Nordblad from the Finnish Education Evaluation Centre acted as project manager of the audit. The audit is based on the material submitted by the higher education institution, self-assessment report, additional material requested by the audit team and the audit team's visit (online) to the institution 23–24 March 2021. The audit team had also access to essential electronic materials and systems. The main stages and timetable of the audit were:

Agreement negotiation	20 January 2020
Appointment of the audit team	12 June 2020
Submission of the audit material and self-assessment report	29 December 2020
Information and discussion event at LUT	11 March 2021
Audit visit	23-24 March 2021
Higher Education Evaluation Committee's decision on the result	16 June 2021

Publication of the report	16 June 2021
Concluding seminar	16 June 2021
Follow-up on the enhancement work	2024

Evaluation criteria

The evaluation areas I–III are each assessed as one entity using the scale *excellent, good, insufficient*.

The level *excellent* means that the HEI shows evidence of long-term and effective enhancement work. The HEI's enhancement activities also create substantial added value for the HEI, stakeholders, or both. The HEI presents compelling examples of successful enhancement activities.

The level *good* for the evaluation areas I–III is described in appendix 1.

The level *insufficient* means that the HEI shows an absence of or major shortcomings in systematic, functioning, and participatory procedures in the evaluation area (I–III). There is no clear evidence of the impact of quality management in the enhancement of activities.

In order for the HEI to pass the audit, the evaluation areas I–III should reach at least the level *good*.

The organisation and strategy of LUT

- Korkeakoulun itsearviointi

The organisation of LUT

The Lappeenranta–Lahti University of Technology LUT specialises in scientific research and academic education in the fields of technology and business administration. LUT and its affiliate, the LAB University of Applied Sciences (LAB), compose a corporate group (LUT Group) to benefit both parties through collaboration.

The University Board, chosen by the collegiate body, is LUT's highest decision-making body. The activity of the university is led by a rector, supported by two vice-rectors, deans of schools and other members of the management committee. LUT's Advisory Board helps LUT to increase its academic impact.

To execute its academic mission, LUT has three schools headed by a dean:

- School of Business and Management (LBM)
- School of Energy Systems (LES)
- School of Engineering Science (LENS).

Multidisciplinary research platforms integrated into the schools strengthen the research activities and impact of LUT's strategic scientific focus areas.

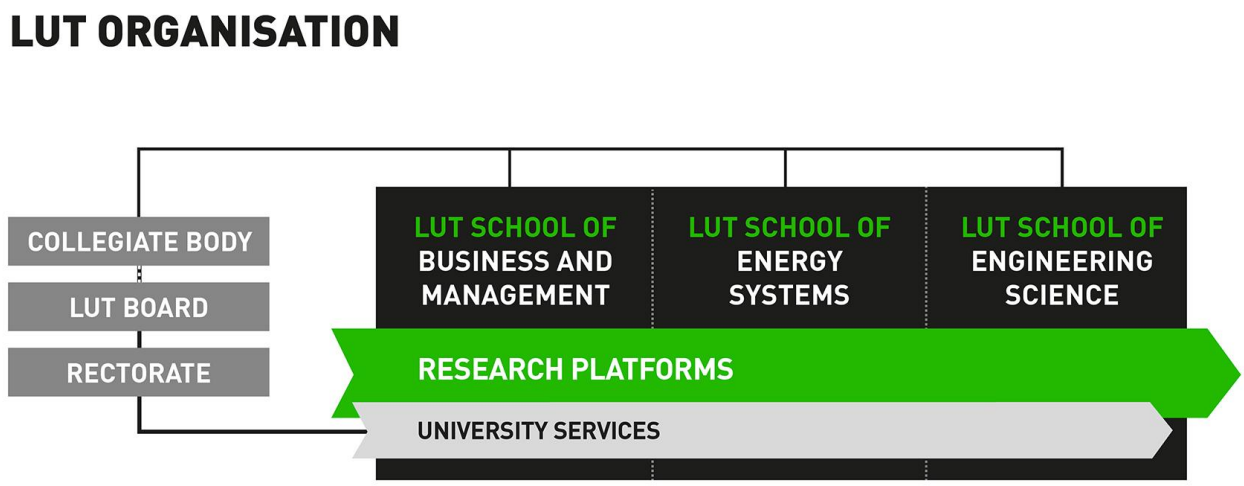


Figure 1. The organisation of LUT

LUT has two campuses – one in Lappeenranta and one in Lahti – and two regional units in the cities of Kouvola and Mikkeli carrying out research and education in accordance with the remit of

the schools. LUT provides centralised support services for both LUT and LAB.

LUT has approx. 5300 students and 940 staff members representing 80 different nationalities (see Key Facts 2019).

Strategy 2030 – Trailblazers – SYSTEM EARTH

The University Board approves the strategy defining LUT's targets and strategic choices. In the Strategy 2030, LUT has defined the strategic focus areas (Figure 2), to which it seeks solutions through technology and business expertise. In addition, LUT follows the growth strategy of the LUT Group, focusing on international student recruitment and education export, new education paths, and making an impact on industries.



Figure 2: Strategic focus areas of research

In its strategy, LUT emphasises the impact of its activities (strategy video). The strategy is complemented by action plans that define concrete actions to achieve the strategic targets. The action plans cover the following themes:

- Significant research player in Europe: excellence in research, strategic partnerships in research and education, open science practices
- Renewers of companies and the society: graduate impact, from research breakthroughs to business, science-based decision-making and communication
- Open, dynamic and attractive intercultural campuses: at home on all campuses, responsive work climate, carbon-negative LUT by 2024.

1 HEI creates competence

- Auditointiryhmän arvio

Evaluation area I assesses the procedures which support student-centred, working-life oriented planning, implementation and enhancement of education, which is based on research or artistic activities.

Based on the audit team’s evaluation, Evaluation Area I is at the level good.

The audit team identified the following as key strengths and recommendations:

Strengths

- Education at Lappeenranta-Lahti University of Technology systematically reflects the university’s strategy.
- Teachers use a competence-based approach and align their courses in accordance with the learning outcomes.
- International accreditations have enhanced quality assurance on the degree level sustainably and contributed to the development of a quality culture.

Recommendations

- The university should continue to work to improve the role of course evaluations in their quality system.
- The university should ensure participation by international students in Finland in the planning and development of the curricula.
- The university should develop a concept for the creation of double degree programmes with strategic partners abroad in order to further enhance the planning and development of double degree programmes.

1.1 The planning of education

- Korkeakoulun itsearviointi

LUT strategy – a basis for planning of education

The LUT Strategy 2030 Trailblazers and its action plans provide guidelines for education planning and define the development targets in education for the strategic period. LUT also has a special strategy to accelerate the digitalisation of education.

The strategic targets are implemented through the university management committee and schools' education management teams. The heads of the degree programmes meet regularly chaired by the Vice-Rector for Education to discuss matters related to bachelor's (BSc) and master's (MSc) degree education and its development. The LUT Doctoral School steering group headed by the Vice-Rector for Research and Innovation deals with matters related to doctoral (DSc) education.

LUT's programme portfolio aligns with the university's strategy and research focus areas, national and international frameworks, and the needs of the world of work. LUT hears its external stakeholders, such as LUT's alumni, research project partners and advisory board members, in the development of the programme portfolio. The BSc and MSc programme portfolios for each academic year and student admission criteria are decided by the Vice-Rector for Education.

The annual curricula and BSc and MSc degree structures and courses are approved by the academic council of each school. This ensures that the intended learning outcomes (ILOs) and programme contents meet the academic requirements of the field of education. The council approves the courses eligible for DSc studies and other requirements concerning DSc education.

The university's top management and student union representatives regularly discuss issues related to studies and teaching. Students are also involved in other working groups at the university, in schools and in degree programmes.

Curriculum work assuring high-quality education

The university degree regulations define objectives for the degrees at levels 6–8 in alignment with the national framework. DSc education is a clearly differentiated third cycle in the degree structure, and in recent years, LUT has made efforts to differentiate the BSc and MSc degrees. Degree regulations and differences in qualifications of BSc and MSc degrees have been carefully considered.

The degree regulations set the framework for curriculum work, defining e.g. guidelines for

student workload for ECTS credits. The Vice-Rector for Education confirms the annual teaching periods and guidelines for curriculum work following an annual plan (Figure 3).

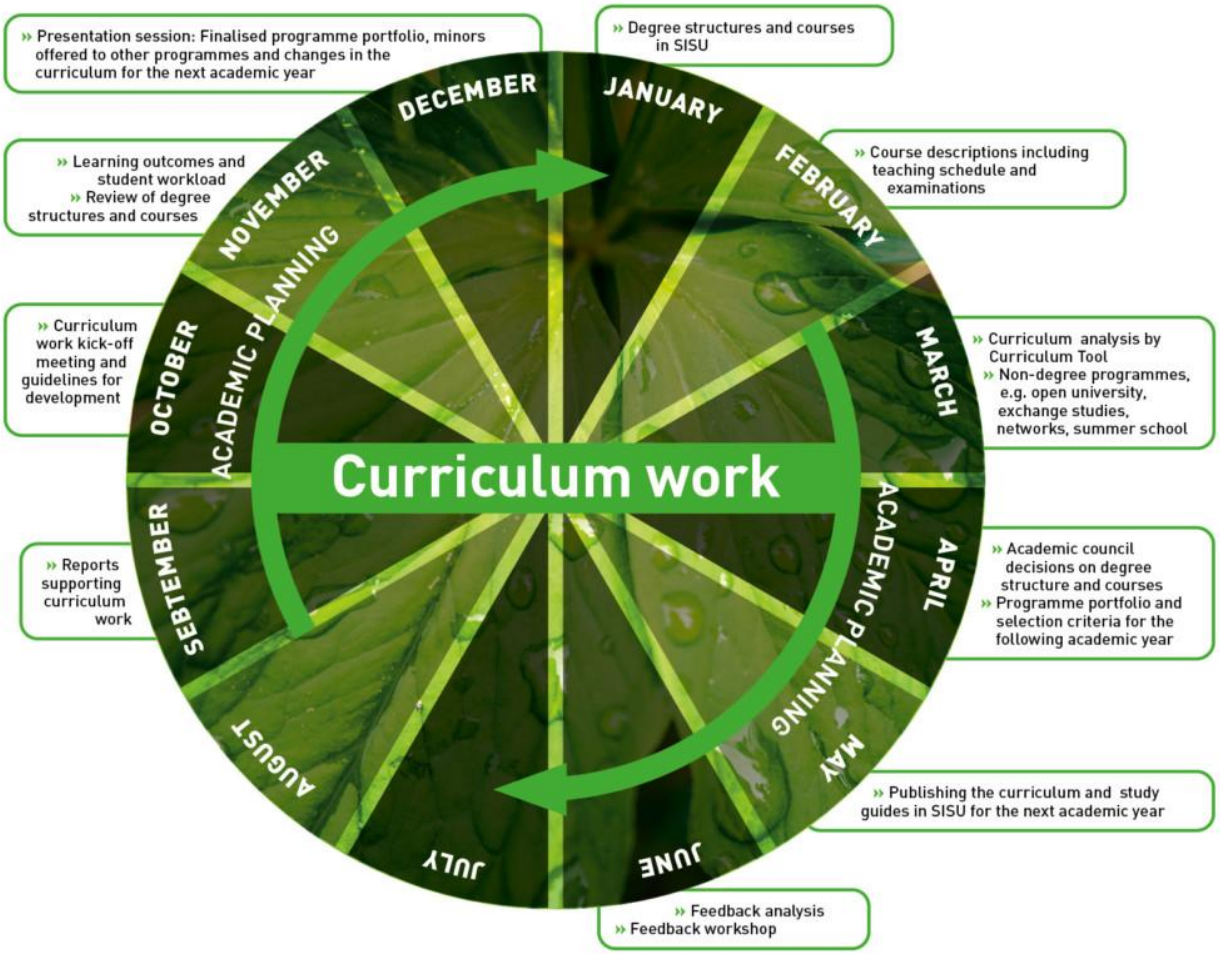


Figure 3: Annual plan for curriculum work

The curriculum work ensures that the course contents, teaching and assessment methods, student workload, and virtual and campus learning environments support students in the achievement of ILOs, progress in studies and future employability. In the schools, the work is managed by the heads of the degree programmes in cooperation with the heads of BSc and MSc programmes.

The study services support the curriculum work and provide help and instructions to the degree programmes. Student feedback and statistical data are provided according to the annual plan (Figure 4) to enable coherent monitoring of programmes, facilitated by the new study information system SISU, introduced in 2020.

Curriculum kick-off meetings are held to discuss curriculum work guidelines, development targets and schedules. The work continues with a programme level review of intended learning

outcomes, degree structures and student workload using e.g. the curriculum tool developed to support programme management. To ensure transparency in education planning, degree programmes present their courses in an annual event before final approval by the academic councils.

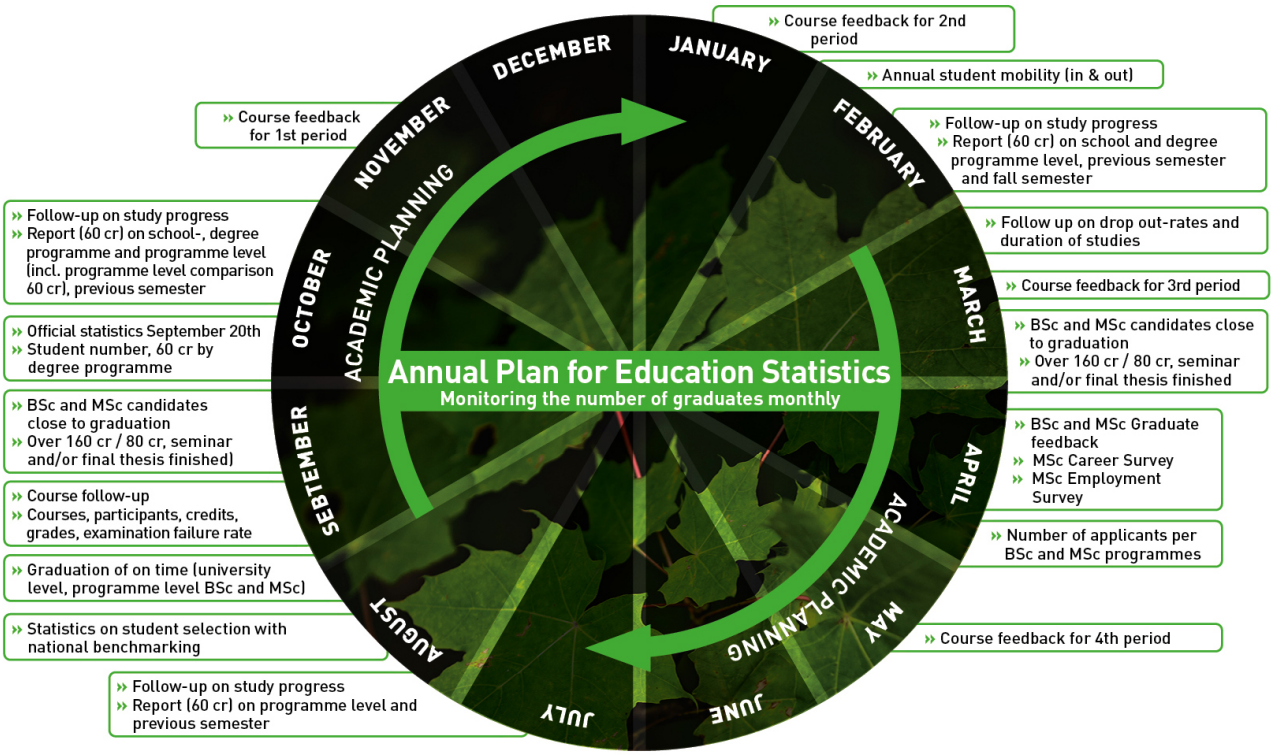


Figure 4: Annual Plan for Education Statistics

Research – an integral part of education

Scientific research is a natural part of all education at LUT, especially in DSc education, which mainly focuses on conducting research. Recent research results are utilised in designing course contents, and this is encouraged in joint meetings of research groups and course development events. Research is integrated into teaching by applying examples and using research articles as course material. Students have an opportunity to participate in research projects through their BSc and MSc theses. Students can take courses and participate in events where prototypes or service concepts are designed together with companies. LUT has built the J. Hyneman Center for rapid prototyping, which brings together students and companies for research and innovation. Moreover, students can be hired for projects as research assistants.

Internationalisation in the planning of education

The planning of education at LUT is strongly based on good practices and guidelines of international accreditation organisations. Cooperation with international partner universities is also strongly reflected in education. LUT exchanges good practices with key partners and

collaborates with them in courses and programmes. LUT collaborates with international universities through double and triple MSc and DSc degrees, where joint supervision is also applied. Co-operation to establish double BSc degrees has started.

Planning of continuous learning integrated into curriculum work

LUT has developed modes of continuous learning according to the increasing needs of society to provide flexible educational paths for different target groups (Figure 5). Planning for continuous learning is an integral part of curriculum work. In the planning of continuing education and on-demand training, customer needs set the starting point.



Figure 5. Continuous learning framework at LUT

Strengths	Enhancement areas
Strong connection between the LUT strategy and curriculum work	Increasing involvement of alumni in degree programmes
Stakeholder views actively utilised in education planning	More systematic integration of joint programmes into curriculum work

Clear education management roles and responsibilities	Continuous learning procedures

1.1 The planning of education

- Auditointiryhmän arvio

Degree programmes have a strong link to the strategy and internationalisation of LUT

The university considers itself as a strategy-driven institution and consequently follows this approach in its degree programme portfolio. Three schools offer bachelor's and master's programmes in the fields of business, engineering and computer science with a strong link to the major thematic areas addressed in the strategy. Through their interdisciplinary approach, some degree programmes are even located at the crossroads of business and engineering as well as natural sciences and engineering. The STEM-driven portfolio reflects very well the idea of a 21st-century technical university that educates its students not only for the sake of education but for educating people who are able to solve future, still unknown problems in a global environment. Over twenty degree programmes taught entirely in English fulfil the ambitious aim to make the university a significant research player in Europe and to offer an intercultural campus to both students and staff. Regular meetings of the heads of degree programmes with the Vice-Rector for Education ensure that degree programmes comply with this strategy. There are clear responsibilities for degree programme development, and there are clear pathways from the schools to the committees in charge and back to the schools. The systematic transmission of the strategy into the programme portfolio is a strength of the university, which considerably enhances the planning of education.

The university's degree regulations comply with the Finnish National Framework for Qualifications (FiNQF). They are available to the public in both Finnish and English on the university's website. The curricula of degree programmes are competence-based.

Working life relevance is a key aspect in the planning of education

LUT has systematic procedures in place to ensure that its degree programmes and other provisions have a strong relevance for working life. LUT obtains feedback from companies for including working life in the planning of education. This includes regional needs, especially for continuous learning, but from regular meetings with strategic industrial partners, where LUT addresses systematically the company's recommendations for the enhancement of education. Working life representatives are part of the University Board and various advisory boards of the schools. The degree programme regulations include language courses with a direct connection to working life, such as professional English, Svenska i arbetslivet or Työelämän viestintä. According to the degree programme descriptions, all programmes contain a project-based approach to learning. In the bachelor's programmes in engineering, there is a compulsory internship. Bachelor

students in business may integrate internships as electives in their studies.

International students should be better engaged in the planning of degree programmes aimed at this group

Internationalisation at LUT is shown in the cooperation with international universities and the educational provisions for international degree-seeking students. International accreditations have accelerated the process of internationalisation of education and brought new ideas to both degree programmes and a quality system. Double-degree programmes with strategic partners in various countries offer a more binding arrangement for international students to spend time in Finland, but according to the website, these seem to work mostly on the basis of recognition of foreign credits and not on the basis of systematic cooperative planning. In its self-assessment, the university has already acknowledged the need for more systematic planning of joint programmes. The university could do this together with its strategic partners, and this initiative could include learning outcomes that more thoroughly reflect the international dimension.

At the same time, the university also aims at providing education for international degree-seeking students, especially on the master's and doctoral levels, in order to increase the number of graduates for both the labour market and future careers in research. The university offers various services for student support, but according to the material available to the audit team, integration into Finnish society is not systematically included in the various degree programmes. According to the interviews, LUT's international graduates do not necessarily stay in Finland permanently, which is a nationwide problem, as discussions indicate. Today, LUT's international students can study Finnish up to level B2 (CEFRL) for free, but this not an integral part of the studies. The university should include the integration of international students in Finland more systematically in the planning of degree programmes aimed at this target group.

According to the self-assessment, the university provides various short programmes and degree programmes in continuous education, which consider the needs of both individuals and companies. The university is a member of the FITech Network, cooperating with other technical universities in the delivery of education. According to the interviews, the university acknowledges the potential of digital learning formats, which enable time- and location-independent studies. However, discussions with university members made it clear that the strategy concerning continuous learning is still a work in progress and that the university awaits further instructions and funding from the Finnish Ministry of Education and Culture (MoEC).

Clear responsibilities and structures support the planning of degree education

Aligning with the academic year, there is an annual plan for curriculum work, which contains a systematic review of learning outcomes and course content. The Vice-Rector for Education and the Academic Council of each school supervises this plan. Continuous data collection from various

internal and external sources supports the curriculum work. According to the interviews, the recently introduced SISU tool has already considerably enhanced systematic monitoring, even though its initiation is not completely finished yet.

Students at LUT profit from the reciprocity of teaching and research, which is an integral part of the HEI type. Reviewed samples from the curricula of the various degree programmes show that the university ensures the acquisition of research competences from the beginning, and various assignments in class help in practising academic working patterns. Staff members usually teach and conduct research at the same time. Depending on the capacity, staff members can sometimes link teaching and research. Both bachelor and master theses have a strong connection to research, especially to third-party funding. According to the discussions during the audit visit, research platforms and the institutionalised dean's coffee meeting form an integral part of multidisciplinary cooperation in both teaching and research. New research topics also lead to the development of courses. In this case, teachers appreciate the pedagogic support from the Opetushelp team very much.

The university measures and monitors workload with the help of the curriculum tool and through student feedback. Teachers have to consider the workload when planning a class. However, according to the discussions among the students during the audit visit, the appropriateness of the workload may vary considerably from one class to the other. But there are also voices emphasising changes in the workload due to both formal and informal feedback as well as exchange on the topic between teachers. The university provides teaching staff with a quality manual for teaching, which explains the idea of learning outcomes and target-oriented class planning, including workload. According to the discussions between the students, it is not always easy for doctoral students to link studies, a dissertation and other research and teaching; this is not a unique problem for LUT. The university should have a closer look at the situation of this group.

LUT actively seeks to meet needs in society and working life

Stakeholders give advice on future planning of education on the University Board or on the various advisory boards at the university. According to the interviews, the university actively enquires about ideas on recent societal challenges from various external think tanks, but it also consults internal experts on specific topics. The university has student representatives on many levels, for example on the University Board or in academic councils of the schools. Much to the regret of the university, international students are insufficiently represented on the various committees. This is partly due to the duration of a mandate (two years), which is too long for international students, and partly due to a lack of information. The participation of international students in quality work is further discussed in Section 3.3.

Responsibilities and procedures in degree-programme approval are both clear and transparent and available to the public. The university's Quality Manual comprises information on

responsibilities in degree programme approval: the University Board decides on the school for a certain degree programme. The Vice-Rector for Education is responsible for the degree regulations and gives guidelines for curriculum design. The Academic Council approves all degree programmes, which the heads of degree programmes develop in cooperation with other faculty members.

1.2 The implementation of education

- Korkeakoulun itsearviointi

Equal procedures for applicants and students

LUT's education, admission criteria, number of study places by programme, and admission process are communicated on LUT's website and the national portal Studyinfo. The related statistics are available in the national Vipunen service, and information on the national joint application procedure for technology and business administration programmes is accessible in the online services www.dia.fi and www.kauppatieteet.fi. The Vice-Rector for Education decides on student admissions, after which the applicants are informed of how the admission or transfer criteria were applied and how the decision can be appealed. Admission services guide the applicants throughout the processes. Applicants to DSc studies find information about the admission process in the UNI portal and receive support from the LUT Doctoral School.

The LUT degree regulations set the rules for degree education. Students can apply to include studies from other institutions and competence acquired in other ways into their degree. The procedure is communicated in the UNI study portal and introduction courses for new students, and supported by study counsellors. The decision to recognise informal learning (e.g. at work) is made by the teacher of a related LUT course.

Student learning in the centre of courses

The head of a programme oversees that course ILOs align with the programme content and ILOs. When designing a course, teachers first define the content, ILOs and student workload in ECTS credits and then accordingly plan suitable learning activities and assessment methods. Most courses apply a variety of learning activities, such as traditional or flipped classroom lectures, exercises, learning assignments, laboratory work, projects, and real-life case studies.

At the beginning of a course, teachers often discuss the ILOs to encourage students' target-oriented studying and challenge students to take responsibility for their own learning. Teachers are encouraged to foster an entrepreneurial mind-set in students and activate learning through assignments. Projects and theses support students' independent and co-operative learning and problem-solving with their peers, guided by teachers. Teachers often ask students for feedback halfway through the course and adapt their teaching accordingly.

Ways of giving feedback to students vary depending on the course. Teachers always give final grades and are also encouraged to give more specific, individual feedback. Teachers do this whenever possible and design different means to provide feedback even in mass courses. The thesis process includes feedback discussions between the student and the supervisor. However,

surveys reveal that many students expect more feedback on their learning, which is challenging due to the increase in online teaching.

Connections with the world of work

To put theory to practice, many courses include cases from the world of work and invite visiting lecturers from companies. The assignments can concern field projects, real-life case studies or genuine problems of companies which require solutions. Most BSc degrees include a compulsory internship, and in MSc degrees, an internship may be included in elective studies. The majority of MSc theses are commissioned by business enterprises, and some dissertations also involve a business partner.

The university promotes corporate collaboration through Career Services, the Firmatiimi corporate outreach team and the J. Hyneman Center and by organising recruitment events where students and employers meet. Career planning of DSc students is supported by mentoring. LUT systematically monitors cooperation with corporate partners on courses. Monitoring proves that the cooperation is very active in every degree programme.

Individual study paths and support for students

Students have several opportunities to create an individual study path, which is supported by a personal study plan (PSP) and study guidance. The PSPs of BSc/MSc degree students are reviewed by study counsellors regularly to ensure their alignment with the degree structure. Elective and minor studies are the most common ways to add individual choices to a degree. LUT provides good possibilities to take part in student exchange and courses from other Finnish universities through the national flexible study right system (JOO) and FiTech cooperation. Furthermore, LUT students can apply to transfer internally from one technology programme to another. For BSc graduates (from universities worldwide), LUT offers over 20 MSc programmes in English and MSc programmes for part-time students mostly in Finnish. For alumni, LUT offers continuous education modules and open university studies.

Study guidance is provided throughout the studies. LUT's study guidance personnel comprises study counsellors, student advisors, study secretaries, teacher tutors and study counselling psychologists. The LUT Doctoral School's personnel review the tailored PSPs of DSc students and give related guidance. Open university and continuing education students have designated guidance personnel. IT services and information specialists at the LUT Academic Library help all students with their special study related questions.

The well-being committee representing staff, students and relevant stakeholders promotes well-being on the campuses based on an annual action plan on student health and health services, sports, tutoring and well-being activities on the campuses. The most prominent activities are the annual well-being weeks. Student well-being is also supported by MOVEO campus sports and gym

and group exercises. Well-being of the students is monitored by graduate surveys, which have indicated that the well-being of LUT students is on good level in the national benchmark. However, the importance of well-being is emphasised in the strategic management.

Strengths	Enhancement areas
Constructive alignment in course implementation	Feedback to students on their learning
Cooperation with the world of work in education	Special career services and support for international students
Flexible study paths and exchange possibilities	Monitoring and supporting study progress

1.2 The implementation of education

- Auditointiryhmän arvio

Transparent procedures to ensure student selection and recognition of prior learning

LUT ensures transparency in its student selection process. As mentioned above, LUT informs about criteria for student admission and selection on both the Finnish and English websites as well as on the national Studyinfo website. The relevant websites include deadlines for application and procedures for admission as well as contact information for further enquiries.

Prior learning is assessed and recognised according to the university's degree regulations, which includes credit transfer from other institutions as well as competences that were not obtained as a part of formal education. Procedures are transparent, and students reported that this procedure works well and regulations and procedures have been recently revised in accordance with the students.

A competence-based approach is used by teachers to align courses

The degree programme descriptions on the website give an overview of teaching methods and target-oriented learning. Samples from both Finnish- and English-taught programmes indicate a large variety of teaching and assessment methodologies. They comprise 'traditional' lectures and exams, but also group work, presentations, quizzes and continuous assessment. Teachers are up to date with modern instruction methodology and engage in individual advancement of the students, especially in practice-oriented learning environments such as laboratory work. Teachers are well aware of competence-based approaches and align their courses with the designated learning outcomes. This is certainly a strength in the university's provision of education. On the one hand, students' voices in the audit point out that the level of teaching may vary considerably for various reasons: A teacher might teach the course for the first time or be very busy with his or her research. On the other hand, there are also numerous examples of understanding, flexible, and student-oriented teachers. Students are obviously satisfied with the various interactive assignments, but they would like to have more facilities for group work, as both library and lunchroom are often too crowded.

Feedback on learning challenges teachers

Discussions among students and teachers during the audit visit touched on the aspect of heterogeneity within the student group, which might lead to different expectations and different capacities to organise oneself. The university provides students with digital information on

studying efficiently and emphasises individual responsibility within the learning process. According to the course descriptions, many courses include both individual and group assignments as continuous assessment, which ensures constant feedback on personal learning progress. Teachers point out that the personal contact in the familiar atmosphere usually makes direct feedback easy but emphasise as well that students should familiarise themselves with the intended learning outcomes of the course more systematically. In return, students told that the amount and periodicity of feedback may vary considerably between degree programmes, teachers and courses.

The connection to professional life is promoted

The needs of working life are present in courses through practical assignments and laboratory work but also case studies with real companies. Company visits and presentations from companies on methods of product analysis and development introduce students to the world of work as well. There are also regular consultations with industry partners on programme-specific boards. Teachers use company projects in order to check their course content for industrial relevance. Feedback from future potential employers (also concerning prospective topics and perceivable trends in the respective branch) help to include working life relevant issues. Teachers pointed out that it is difficult, however, to practice soft skills—which are particularly important for working life—in an online environment. Despite this, teachers use their networks within the professional practice for enhancing courses. They also profit from doctoral students with practical experience, who introduce a new perspective to courses. In general, students appreciate the inclusion of work-related issues and the work in international student teams. However, some of the students reported during the audit visit that they would like to have even more practical assignments and more case studies as well as more support when entering the job market. According to the students, professors and teachers with a professional career only within the university could profit from more real-life projects, professional certificates or even industrial internships for the enhancement of their courses.

The university degree regulations include paragraphs on the recognition of studies at other higher education institutions. According to the degree programme descriptions, students may undertake part of their specialisation studies abroad. Besides, in accordance with the university degree regulations, all students receive a personal study plan that supports students in organising themselves. Students told during the audit visit that there is even a special exam room, where a student can schedule exams individually according to his or her personal timetable.

The well-being of students is promoted throughout their study path

The university offers various counselling and support services along the entire student life cycle, which cover study orientation, studies abroad and entering the job market. Counselling takes place in private meetings upon appointment with the study councellor, information specialist or in

group meetings. There are special offers for doctoral students to ensure a good start within the programme. According to the interviews, the university regularly collects feedback data for continuous improvement, and support services discuss the results with both schools and student representatives. In case of stress or the risk of burnout, students may contact the study counselling psychologist. The personal study plan is an important tool for continuous guidance, as it is revised regularly. The university assures the well-being of students through various activities throughout the academic year. The student union systematically informs students about sports and the annual well-being week in both Finnish and English. There are also health services for students, including health weeks that address special issues such as mental health.

The university has recently updated its equality and discrimination plan, which contains actions for enhancing equality, such as improving international students' representation in administrative bodies and guidelines on inappropriate conduct. The interviewees mentioned that the student union appointed harassment contact personnel.

1.3 The evaluation and enhancement of education

- Korkeakoulun itsearviointi

Decision-making structure ensuring continuous development

To strengthen the impact and active development of education, LUT has clarified the roles and division of responsibilities in education management. The vice-rectors, director of international and study affairs, deans, heads of DSc programmes, heads of degree programmes and heads of the BSc or MSc programmes are responsible for the development of education. They ensure that development needs arising from the systematic monitoring of performance, feedback surveys, scientific research or world of work will be addressed.

Learning outcomes – the main impact of education

Objectives for student learning are defined in programme learning outcomes, which are operationalised on courses and evaluated based on specific assessment means. The alignment of the goals at the BSc/MSc programme and course levels is ensured by the curriculum tool, which helps in evaluating the appropriateness of learning activities, assessment methods and the student workload. Students' self-assessment through graduate surveys is utilised in assessing competence development. The School of Business and Management (LBM) has introduced an intensive Assurance of Learning model to evaluate student learning. Assessments of student competences are utilised in curriculum work.

Cooperation with external stakeholders

LUT's strength is its active, research-based cooperation with companies, which inspires the development of education and definition of learning outcomes. Supported by LUT Career Services and the Firmatiimi corporate outreach team, companies and business representatives are involved in education as visiting lecturers, thesis commissioners, assignment and internship providers and future employers. Information on competence needs and trends in the world of work is obtained in the university's strategy work and board and advisory board meetings. LUT has agilely modified its programme portfolio and launched online MSc programmes in engineering to serve different target groups. The university responds flexibly to the competence needs of business life through DSc education and lifelong learning possibilities. LUT has strengthened its lifelong learning services consisting of open university and continuous education and renewed its degree education for part time students.

Internationalisation assuring high quality education

Internationalisation has been a driving force in education development at all degree levels. It improves the degree programmes' curricula and the competences of students to act in and influence the global world of work. Internationalisation means active partnerships with foreign universities, providing high-quality exchange possibilities and benchmarking, and participating in international networks. International accreditations serve as a valuable checkpoint and support for the development of education.

Established indicators and stakeholder feedback procedures

The systematic monitoring of programme performance and collaborative review of feedback reports form the basis of annual BSc and MSc programme reviews. Statistics (Figure 4) and indicators through which the attractiveness, quality and impact of programmes are monitored reveal the strengths and development targets in education. The doctoral school monitors the progress of DSc students and provides reports to schools. Profiling the programme portfolio and developing career services are examples of development activities based on the monitoring.

Several channels provide feedback on education from a variety of stakeholders: students on courses, first-year students and graduates, commissioners of theses and alumni. The university utilises feedback compiled by its partners, e.g. the student union. The response rate of graduate surveys is excellent, but the low response rate of course feedback is a challenge, which has been tackled e.g. by responding to feedback. Course feedback cooperation with student guilds, regular feedback events, and the Teacher of the Year Award based on course feedback have strengthened the feedback culture. In 2017, degree programme feedback workshops were introduced, and feedback on education is discussed once a year in a university management committee meeting. In DSc education, feedback is discussed in the doctoral school steering group and development targets are agreed upon. The quality management of customer-driven continuing education is also based on a strong feedback culture and interaction with participants.

University Services help achieve the goals

University Services support achieving both LUT's operational and strategic goals, and the performance of support services is assessed based on the performance of the university. University Services provide specific services, e.g. career services and university pedagogical training, to assure the impact and continuous development of education. The management of University Services works in close cooperation with LUT administration, ensuring that the goals for the university can be reached. Regular feedback surveys, institutional meetings, and interaction with customers are channels for feedback to University Services. Numerous concrete measures prove the continuous improvement of support services, e.g. training for DSc students' supervisors. To increase the efficiency of supporting functions, the systematic analysis of processes has started in 2020.

Strengths	Enhancement areas
Commitment to international accreditations of degree programmes	Information system for monitoring study progress
Well-established indicators to monitor the quality of education	More automatised course feedback system
Procedures for utilising feedback inspiring development	Establishing the support service process development work

1.3 The evaluation and enhancement of education

- Auditointiryhmän arvio

LUT should continue its work to improve course evaluations

In cooperation with the student unions and student associations on campus, the university regularly collects online feedback from the students. Teacher tutors and heads of degree programmes are visible as responsible people, and students may address them as well for initiating improvement. According to the audit visit, most teaching staff improve courses due to feedback from students, and direct discussions with professors and teachers have led to improvement in teaching and assessment methodology. However, the response rates to the course feedback survey are low, which makes it difficult to close the PDCA cycle appropriately. This is not a phenomenon restricted to LUT, as evaluation fatigue seems to be a general problem among students. According to the discussions during the audit visit, one reason could be that students do not see any effect of their ideas for improvement, as feedback is usually collected once the course is over, and the teacher for the course might not be the same person in the next term. The university should review current routines for course evaluations and take measures to strengthen the role of course evaluations in their quality system. Such work should include routines for collecting feedback, which can take into account the time and periodicity of the feedback collection, as well as qualitative methods and analysis of documents, which are produced anyway (so-called non-responsive methods). This could include a systematic analysis of learning diaries or a closer look at student chats in the flipped classroom. LUT staff interviewed during the audit visit made the last two suggestions themselves, and this approach would comply with both the size and innovative spirit of the university. The university should also consider a more systematic reflection of the feedback results and a discussion of possible solutions for improvement with the students, which might be beneficial for response rates as well.

International accreditations have enhanced degree-level quality management

The university collects feedback and data throughout the year with a strong focus on graduates' performance in working life. There are key figures that are monitored regularly on various organisational levels. These key figures concern, for instance, employment rates and salary levels of graduates. The audit team highlights this systematic approach with clear responsibilities between management, schools, administration and third space, although the extensive data might sometimes be difficult to handle. In addition to that, international accreditations have contributed considerably to the enhancement of quality work on the programme level. The interviewees highlighted international accreditation for the introduction of new, systematic approaches to quality assurance at LUT University. During the past few years, the university has

introduced continuous improvements according to the accreditation results and has worked on learning outcomes, their implementation and the employability of graduates. Therefore, these accreditations have been much more for the university than only a seal from an accreditation body.

As far as the changing needs of society are concerned, the university receives input for enhancement from external stakeholders on the University Board and various advisory boards. The university offers various opportunities for continuous learning, which is more a grown concept than a strategic or systematic approach. The university is aware of this issue, but according to the interviews, much depends on available funding as well.

The needs of staff and students are considered in the development of support services

Support services rely on direct feedback from the students. There are special workshops and surveys addressing various needs of the students for different purposes as well as an open feedback possibility in the intranet. The university acknowledges the need of adapting service to user groups with different educational, linguistic and cultural backgrounds. Regular formal and informal meetings on the support service directors' level as well as within the teams ensure that the units reflect upon the feedback results and also upcoming issues, such as the pandemic. Theme-specific meetings complete the enhancement of the service quality. In addition to that, interviewees emphasised the importance of their national network to learn about best practices at other institutions and apply them to the needs of LUT.

1.4 LUT’s examples of successful enhancement activities

- Korkeakoulun itsearviointi

Degree programme management

Management has been developed based on strategic targets set in 2015. The roles of heads of degree programmes have been strengthened as the leaders of BSc and MSc degree education. The Vice-Rector for Education and Director of Study and International Affairs support the heads of degree programmes in their management duties, and topical issues are discussed in regular meetings where ideas are shared and procedures are agreed on. This cooperation results e.g. in the coherent development of the programme portfolio and online education practices. It has been crucial also in tackling the challenges caused by the pandemic.

International accreditations

From its first external audit in 2009, LUT has been committed to the continuous improvement of its education by the standards of international accreditations. Currently, seven BSc programmes and 14 MSc programmes are accredited – most of them already reaccredited once. In addition, LBM is applying for an institutional accreditation. Accreditation gives LUT graduates an international recognition for their degrees and the university valuable quality assessment to build cooperation with international partner universities. Accreditations have promoted competence-based curriculum work, the two-cycle BSc and MSc degree structure, the internationalisation of education, and internal quality management procedures.

Cooperative approach in feedback management

LUT student guilds have started collecting and reporting course feedback as of 2015. The system was first piloted in two degree programmes and then implemented in all programmes based on the good experiences. Supported by study service personnel, student guilds send course feedback surveys to respondents and feedback reports to teachers following common guidelines. The guilds are reimbursed for the job, and more importantly, get information on student views and teaching in their degree programme, which they can discuss in different meetings and feedback workshops of the degree programme. In annual feedback workshops, arranged since 2017, student guild representatives and teaching personnel discuss feedback reports concerning their degree programme. As a result, necessary development measures are agreed on. In the next year’s workshop, the loop is closed by checking the outcome of the development measures. The feedback workshops assure systematic analysis, thorough examination and utilisation of feedback.

Training for supervisors of doctoral students

LUT issued recommendations for good supervision practices of DSc students in 2015 and has arranged training for supervisors in DSc education since 2016. The 3 ECTS credit course can be included in LUT's university pedagogy training as an optional module. It consists of five workshops on supervising in practice, well-being at work, grant writing and funding applications, good scientific practice, and HR and project management. The accessibility of the workshops has been ensured by providing it both on-site and online, and the recorded workshops are available to participants for later use. Participants can take the whole course or individual workshops. The annually provided training has reached 85 participants and has been developed based on feedback. Many universities have benchmarked the training and utilised it in their context.

Online course for career planning

Find Your Career is a virtual self-study platform containing modules for career planning and job hunting. It provides students of all cycles topical career services and serves as a 2 ECTS credit elective course that can be included in a degree. Students choose the study modules that interest them and receive personal comments on some. Currently, the platform contains seven modules, and new ones will be added according to students' needs. During the first two academic years, more than 700 students have registered to the platform, and about 400 assignments were done in the academic year 2019–20.

Recruitment partnerships

Recruitment partnership is a service aiming to create long-term partnerships with companies having a regular need for new talents from LUT. The service aims to increase employer visibility and interaction with selected LUT student groups. It is always tailored to the company's needs. A variety of tools are employed, such as coverage to increase recognisability, marketing to support employer branding, cooperation with students to get first-hand experience, and recruitment support to reach the best candidates. The recruitment partnership service was started with four partners in the academic year 2019–20. The experience has been encouraging and the number of partners will be increased gradually, but the total number of partners will be limited.

2 HEI promotes impact and renewal

- Auditointiryhmän arvio

Evaluation Area II assesses the procedures used to manage and improve societal engagement, strengthen the impact of HEI's research, development and innovation, and support an innovative organisational culture.

Based on the audit team's evaluation, Evaluation Area II is at the level excellent.

The audit team identified the following as key strengths and recommendations:

Strengths

- LUT has strongly strategy-based, systematic and consistent management and improvement of its societal engagement and impact. LUT systematically collects information from its operational environment and monitors key performance and strategic indicators, and uses the information to redirect its activities.
- LUT's organisational culture is open, entrepreneurial and collaborative, supporting new ideas and innovations.
- The university has a clear direction and mechanisms in its research and education activities targeting different levels and groups. LUT succeeds in engaging and creating an impact on the regional, national and international levels and adding value both to LUT, its students, partners and stakeholders.

Recommendations

- LUT could benefit from ensuring that research ethics are considered as precautionary measures and are introduced in the early stages of both research planning and the researcher career.
- LUT could benefit from elaborating on a rector's decision on the 100% open publishing requirement and ensuring that it is included in research planning and budgeting.
- LUT is aiming for stronger internationalisation in its activities and campuses. It is important that the university considers its international teachers, researchers and students in all its activities.

2.1 Managing societal engagement and impact

- Korkeakoulun itsearviointi

The impact of the university at the heart of LUT’s strategy

LUT affects society particularly at two levels: globally through research across different themes of sustainability, and at the corporate level by providing businesses with experts, expertise and practical solutions.

Strengthening the university’s impact is reflected in LUT’s strategy and action plans that guide the strategy implementation. The strategy slogan ‘science with a purpose’ expresses that the strategy aims for strong effectiveness. Strategic success is monitored through impact indicators, e.g. business and industry cooperation, the employment of graduates and the carbon negativity of the university. The university’s internal funding model supports the implementation of strategic goals in the schools, and the performance agreement between the university and the Ministry of Education and Culture (MoEC) contains the same objectives.

Management of agile societal interaction

Strengthening the impact of the university’s activities is one of the tasks of the university’s top management, which is strategically guided by the board. The division of duties of administration supports cooperation with national, international and local partners. Deans and directors are responsible for societal interaction management in their units. The Director of Administrative Services is responsible for the societal interaction processes that increase the impact of research and education, and the vice-rectors have a key role in the strategic development of these services. The meetings of the university management committee, administration and directors of University Services units support the management of societal interaction.

LUT’s societal interaction consists of established procedures to support collaboration with key external stakeholders. Each of these processes has a designated coordinator and quality management procedures to ensure continuous development: e.g. innovation services support and monitor patents and invention notifications, and the Junior University assures the implementation of its curriculum.

Societal interaction requires flexibility to respond to emerging challenges and changes in the operating environment. As a result, societal interaction is diverse and agile. From the point of view of quality management, the situation is challenging, but it is important for LUT to respond to the changes in the operation environment. Thus, new forms of cooperation are actively developed as exemplified by the J. Hyneman Center, Firmatiimi and innovation services.

Wide-ranging information of the operating environment

The management service unit supports the administration and staff members responsible for different units or activities in monitoring and analysing the operating environment. Information on the operating environment is collected and utilised e.g. in defining the strategic focus areas, in developing different functions and in positioning in the national and international higher education field. The challenge is that the information, as well as the expertise on its contents, is often scattered throughout the organisation.

The university operating environment is analysed regularly when the university revises its strategy and applies for competitive funding from the Academy of Finland. The management committee and board annually receive a summary of the university's statistics, and the need for specified unit level positioning statistics has increased.

The MoEC supports the university's operating environment analysis with the publicly available information base Vipunen and in meetings about current issues in the international and national higher education field. The Academy of Finland collects, analyses and delivers data on science and research. LUT's EU office in Brussels monitors developments in the European Union. LUT obtains information on regional development by participating in regional programmes.

The university's top management and experts participate in national higher education cooperation forums, such as UNIFI and national events, which address the future of the whole country. Information is passed on e.g. through meetings of the university's management committee and administration. National cooperation in university education and research is utilised e.g. in profiling research and planning degree programmes. In addition, external evaluations and international assessments of education and research support the development of the university's activities and impact.

Strengths	Enhancement areas
Striving for impact as a strong strategic goal	Activating LUT experts to influence in decision-making and public engagement
Agile development of operating models	Coordination of cooperation with external stakeholders
Operating environment analysis utilising several data channels	Information channels for monitoring societal interaction and impact

2.1 Managing the societal engagement and impact

- Auditointiryhmän arvio

Strongly strategy-driven management of societal engagement and impact

LUT's objectives for societal engagement are guided by its mission, given a strong direction by its strategy and further specified in LUT's strategic action plan 2020–2025. As mentioned in the self-assessment, LUT's strategy, 'Trailblazers 2030', with the strong focus on sustainable development and science with a purpose is, per se, aiming for societal impact. The three action plans 2020–2025 further define how LUT attempts to reach its strategic goals, responsible parties for the implementation, and indicators for measuring achievement. The strategic development of LUT has been a long-term project, in which the two previous strategies and the current one have built on each other.

Based on the LUT quality manual, the key impact indicators and strategic objectives for societal engagement to be reached by 2025 are:

- 10 showcases of research excellence
- 15% annual increase in citations (Scopus)
- 100% of publications open access
- € 5 million annual funding by the European Commission
- € 5 million external revenue from education annually
- Graduate employment rate tops that of other universities
- Leading partner in industry cooperation in Finland
- Carbon negative LUT in 2024.

LUT manages activities that promote societal engagement and impact in several different ways. These activities are tightly knitted into everyday research and education. As described in the documentation, the university sees societal engagement as rooted in research and education but at the same time facilitating the other two missions. This is also reflected in LUT's operations management and follow-up of societal engagement and impact, which at the operational level is focused on indicators of research and education. The influence of the performance indicators of the Ministry of Education and Culture (MoEC) is apparent. The MoEC performance indicators are also internal funding indicators and form the basis for the annual performance targets set for schools and are linked to incentives and the salary system. The indicators are monitored closely and openly reported within the university community. The statistics concerning the indicators are put together by the university services for the management committee, schools and departments, and the results are reported at every management committee meeting by the deans of the schools.

The MoEC funding indicators, as such, do not give a sufficiently comprehensive overview of monitoring data on the societal engagement and impact of LUT's activities to support the achievement of its strategic objectives. Therefore, the audit team commends LUT for its strategic action plan, which includes a much wider spectrum of quantitative but also qualitative indicators defined for each action to be taken under the three-part action plans. There are also several indicators related to societal engagement and impact such as IPR transferred to enterprises in research projects to highlight the benefits of collaboration with LUT or following the employment rate of international graduates to improve their integration in society. Based on the interviews and documentation, LUT's strategic objectives and the strategic actions planned are systematically followed up by a set of indicators at each board meeting. The board's annual cycle also includes checkpoints when the implementation of the strategy is discussed. In addition, there is a more in-depth bi-annual evaluation of the strategy to follow up achievements, where the institution is heading and if any adjustments are needed. As for other HEIs, one of the university's main impacts on society is achieved through its graduates as future employees who change companies from within or as entrepreneurs. As mentioned, graduate employment and salary levels are monitored and compared with other universities. The way LUT monitors its impact seems to support the levels where it is aiming for impact. Nonetheless, by integrating some of the key objectives and indicators of its strategic action plans in its annual operations plan, the university could further enhance how the management system supports the achievement of its strategic objectives, including societal engagement and impact.

The overall management responsibilities for societal engagement have been clearly defined in the quality manual. LUT has also identified key mechanisms and processes that pursue LUT's objectives and support societal engagement, which include alumni relations, career services, continuous learning, external communication, the Firmatiimi business outreach team, innovation and commercialisation of research results, the J. Hyneman Center for rapid prototyping, Junior University and sustainability. J. Hyneman Center and Junior University are examples of excellent enhancement activities (See Section 1.4.).

LUT actively analyses its operational environment

In the audit interviews, LUT top management, board representatives and the deans of schools broadly approached LUT's operational environment. The interviews confirmed that the University Board and management actively collect and analyse different signals from the operational environment. In this work, LUT uses both external sources such as networks, benchmarking, following international universities and competitors, companies, strategic partners, research institutes and think tanks and experts as well as LUT internal experts such as professors. As an example, the board organises informal meetings the evening before the official meeting where the board meets these experts to discuss topical issues. The audit team considers this a good practice. The interviewed deans mentioned various inputs and fields they followed, depending on the school. The foresight information was discussed at management committee meetings, meetings at faculties and as part of strategic development. LUT also has a separate advisory

board consisting of influential stakeholder representatives with broad business and political experience relevant to the LUT profile. The advisory board is used in analysing the operational environment; it was involved in the strategy round with future-oriented discussions. The chair of the University Board is now the chair of the advisory board, creating a link between the two boards. LUT actively evaluates what kind of information it needs and then gathers it. LUT has functioning ways to analyse its operational environment, but some management representatives wished for more foresight into their activities with an emphasis on long-term insight and forecasts.

Overall, the improvement actions related to societal engagement and impact are taken at different levels as part of strategic management, analysis of the operational environment, partnerships and collaboration with customers, as also identified by LUT. The information LUT receives is used to set the direction for its activities. There were several examples of how LUT had used the information as the basis for decisions. The evidence confirms systematic planning, implementation and follow-up, and improvement of activities related to societal engagement and impact. LUT is managed in a way in which the strategy permeates the activities of the institution, the action plans provides a clear direction for the activities, and there are a variety of indicators to measure success in the set objectives. LUT actively engages with its surrounding environment, uses various ways of collecting foresight information but, at the same time, is proactive in its approach and wants to influence its environment so that it would be favourable for its development and funding.

2.2 Research, development and innovation activities with impact

- Korkeakoulun itsearviointi

Science with a purpose as a shared goal

According to the LUT strategy, LUT's research, development and innovation activities strive to create a more sustainable world by focusing on four global themes deriving from LUT's key competence areas in research: air, energy, business and water.



Figure 6: LUT Strategy 2030 focus areas

To increase its scientific impact, LUT has set up a tenure track, improved its recruitment procedures, clarified its targets and provided incentives and guidance for researchers. LUT's high-level publications and citations have increased in recent years, as national and international statistics show. LUT has a long tradition in collaborative research projects with companies, remarkably increasing the impact of LUT's research. Based on industry income, the impact of research is one of LUT's strengths. LUT has a strategic action plan for developing industry cooperation further.

Framework for the responsible conduct of research

Well-defined responsibilities for research management and support services, a robust recruitment policy, clear target setting, committing to ethical guidelines for research, and the systematic evaluation of research form the basis for the responsible conduct of research.

The Vice-Rector for Research and Innovation is responsible for LUT's research and its strategic development overall. Deans, heads of the departments and research units and professors heading research groups play a key role in research management. They oversee that research projects and funding applications align with the university's priorities. LUT's research, development and innovation activities are mainly organised into research groups operating within the departments of each school. Research groups are composed of researchers at different stages of their career, and detailed qualification criteria are used when recruiting new researchers.

The university holds annual development discussions with employees to ensure that they work responsibly and successfully according to university targets. In addition to personal objectives, the evaluation of a researcher follows LUT's strategic objectives and national recommendations for research assessment practices and the responsible use of metrics. The salary and incentive system for research and teaching personnel guides and supports researchers towards high standard scientific research and publication.

Good scientific practice and open science procedures

Each researcher is responsible for observing good scientific practice, but so is each supervisor, the whole research group, the head of a research unit and the administration of the university. LUT provides researchers guidelines, education and support services on research ethics. The LUT Doctoral School gives a course on research ethics which is open to all students and staff. LUT's research services help with research funding, project management and ethical issues by advising and doing preliminary ethical reviews for research projects.

LUT has adopted an Open Access Policy and Open Data Policy in 2015–16. Articles published by LUT researchers are expected to be available openly, and guidelines on publishing are given by the LUT Academic Library. The library supports researchers in publishing research articles in open access repositories. In 2019, LUT reached the highest maturity level in the MoEC evaluation on the openness of operational cultures in research organisations. LUT has targeted and planned several activities to promote open research data further.

LUT researchers are encouraged to communicate their research to society. LUT's media services help researchers and have defined guidelines for communication. LUT also provides social media training for researchers.

Assuring the impact of LUT research

LUT systematically assesses its performance in research based on the indicators and objectives in its strategy, strategic action and annual operations plan. The indicators are monitored regularly, and the results are discussed in board meetings and management group meetings and published on LUT's intranet front page. To support the implementation of the strategy, the performance of researchers is evaluated in relation to the new strategic focus areas.

LUT implements the United Nation's Sustainable Development Goals (SDGs) in science in accordance with its strategy. To assess its success and to improve its impact, LUT participates in the Times Higher Education Impact Ranking. To strengthen the university's research profile, LUT participates in the Academy of Finland's competitive funding applications.

In 2015–2016, LUT established research platforms based on an international peer review process to develop interdisciplinary research between its schools on the key questions related to its strategy. The research platforms proved to be an efficient means to boost the impact of research. In 2020, a competition was organised for new strategic profiling areas, and the new platforms will start their term in 2021.

LUT has its research assessed by external reviewers regularly. An international assessment has been executed twice, in 2012 and 2019. In the latest assessment, the Research and Impact Assessment (RIA), a panel of peer reviewers assessed the quality, academic impact, societal impact, environment and future potential of research at LUT. RIA included written self-assessments by LUT schools and research platforms, intensive research data and interviews. The assessment yielded several recommendations which have been included in the current strategy.

Strengths	**Enhancement areas**
Strong impact of the strategic focus areas of research	Boosting science-based decision-making and interaction internationally
Active collaboration with companies	More active role in international scientific and stakeholder networks
Working process supporting progress from research to new business models	Strengthening open science practices

2.2 Research, development, and innovation activities with impact

- Auditointiryhmän arvio

Research platforms – a strong strategic steering mechanism

As mentioned in LUT's self-assessment, its research is focused on seeking new sustainable solutions in clean energy, water and air in its fields of technology and business as well as on supporting society and businesses in their sustainable renewal. LUT's research, development and innovation activities (RDI) target dually on the global level phenomena, aiming for global impact, and to the local level mainly via research, development and innovation activities with businesses diversifying the impact of its activities.

The core of LUT's research activities is its five multidisciplinary research platforms that are strongly linked to its strategy and the related impact it is striving for. The research platforms appear as a strong strategic steering mechanism of research. Two internal open calls for proposals with external review panels have been organised for selecting the research platforms. LUT has organised two research and impact assessment exercises in 2012 and 2019, each conducted by an international panel of experts. The assessments have been connected to the strategic development of LUT and its research platforms. As mentioned in the interviews, the latest assessment of 2019 was timed so that it contributed to the strategy process of LUT, and outcomes and development ideas of the assessment have been used in defining the focus areas for research and also to develop the steering.

Based on the audit visit, it was very clear that the strategic focus areas of research and strategic objectives also strongly steer LUT's RDI activities in terms of collaborations and partnerships with businesses. LUT has several functioning mechanisms for RDI activities that build on utilising the research conducted at LUT, creating new innovation and commercialising its research results. Research breakthroughs for business is an area where LUT is seeking to further improve. The number of start-ups, spin-offs and patents used is based on the interviews some of the good follow-up indicators of the societal impact of LUT's research. The university seems to have found a balance in combining academic rigour and a high level of research with company collaboration in research.

As already discussed, roles and responsibilities, core processes, assessment indicators and procedures for improving the quality of societal engagement and impact—but also research activities more widely—have been clearly defined. As in LUT's activities in general, the university has set clear strategic targets, actions, support structures and relevant assessment indicators for its RDI activities and their impact. The continuous collection of information on meeting these

targets, reporting and checkpoints for reviewing the actions taken combined with an external assessment of LUT's strategic research platforms underline the consistent strategic management of research activities. In terms of research and its societal impact, improvements and a re-direction of activities have been done, especially as part of the more long-term strategic development processes and based on international assessments.

Procedures are in place to enhance open science

LUT is committed to open science, which it considers as one way to increase the societal impact of its research. Open science is highlighted as one action point in the university's strategic action plan for research. The targets are 100% open access to scientific publications and an increase in the publishing of metadata. The aim is to make parallel publishing and open research metadata a standard procedure for all researchers. LUT has clear policies and procedures to promote the publishing of open access publications and research data. The library provides proactive guidance and support. Based on the guidelines, the research plan should include both a data management plan and how the results are published. Internal incentives have been attached to the publishing of scientific journals and open access publishing. Staff receive a bonus if they publish an article in a scientific journal (JUFO 2 and 3), but only if the article is published as an open-access publication. The level of open science is at a good level at LUT. However, in order to achieve its targets, further measures are needed, such as multiple information channels to reach all researchers and making sure open access is included in research planning and budgeting.

A more proactive approach to research ethics is proposed

Research ethics is one of the core processes of research at LUT. LUT has guidance and procedures in place to ensure that students and researchers conduct research responsibly. As mentioned, courses in research ethics and discussion seminars on responsible conduct of research are organised mainly for doctoral students, but they are also available for staff. For ethical reviews and statements and for clear violations of responsible conduct or allegations for misconduct in research, LUT has clear procedures that follow the national ethical guidelines of the Finnish National Board on Research Integrity TENK. The university could benefit from ensuring that research ethics are considered as precautionary measures and introduced in the early stages of both research planning and researcher career.

LUT follows its strategy also in communication activities. The support provided by Communications and Marketing is two-sided: helping LUT researchers and experts to communicate their results and in return helping media to find LUT and its experts. The university's visibility in traditional and social media is followed and reported. The action plan also has action targets to enhance the publication and communication of research results and the influence of its research teams in scientific decision-making. Enhancing the information flow between research teams and Communications and Marketing, training of researchers, providing examples of best practices and regularly recognising significant communication and the media

success of researchers are some of the measures taken. LUT schools have dedicated communications officers to enhance the dissemination of research results to the public.

2.3 Promoting renewal through the organisational culture

- Korkeakoulun itsearviointi

Open your mind at LUT

LUT's values encourage all university community members to think innovatively and try new ways of working. The open-minded organisational culture is visible in the university's brand, strategy, communication and working practices. Establishing the unique LUT Group is a practical example of LUT's innovative culture, as is the 2016 Firetail evaluation, which listed LUT as one of the world's top 20 challenger universities for 2030.

LUT's operating culture is characterised by a low hierarchy and easily approachable administration. Staff and students are encouraged to participate and present their ideas e.g. in surveys concerning strategic targets and the renewal of the LUT websites. Piloting is used to test and refine new operating models. The university has piloted e.g. career planning included on courses.

In development projects, the best experts are invited to contribute, and both staff and students work together towards a common goal. Students often provide crucial added value in the university's activities and they are hired to work as tutors, research assistants and career service assistants.

Special functions, such as research platforms and the J. Hyneman Center, strengthen LUT's innovation activities. In 2020, the Oivallus-team was established to improve the user experiences of LUT through service design e.g. in cooperation between the university and companies.

Strengthening partnerships

To increase the efficiency and impact of its operations, LUT targets long-term strategic partnerships in research and education. The aim is to establish strong international research partnerships to advance the impact of research, to build high-quality educational cooperation, and to help regions and companies to prosper through university cooperation.

LUT has launched a key account management approach to enable systematic, effective and expanding cooperation with select partners. The model will cover a wide range of corporate and academic cooperation. Joint research, academic and student mobility, and the creation and co-use of research infrastructure are developed with academic partners. LUT's schools have identified the international partner universities with the most potential, LUT's benchlearning partner Politechnico di Milano (PoliMi) being one of them. The current educational partner universities are presented on the LUT website.

From the beginning, LUT has been known for its corporate collaboration. In addition to research and teaching personnel, multiple actors are operating at the company interface. LUT has recruited professors of practice since 2013, and industry professorships have been introduced in 2020. LUT has several processes to support cooperation with companies e.g.: Laboratories and LUT Voima offering technical services to companies, and Firmatiimi helping companies to find students to complete assignments for them. There are plenty of examples of cooperation where new knowledge and solutions have been created with external stakeholders (e.g. Kivisalmi pumping station). However, the need to serve the company interface more effectively has been identified. Key account management has promoted the cooperation and the first two strategic partnerships (with Yaskawa Environmental Energy and Danfoss Editron), and collaboration with the first recruitment partners has started.

Active networking with stakeholders

Networking with prior stakeholders supports LUT's development and strengthens its impact. LUT is a member of several international scientific and educational networks (e.g. EIT Raw Materials, European Energy Research Alliance EERA, and EFMD). By actively participating in university networks, e.g. EUA, Scancor and Nordtek, LUT has been able to strengthen student and researcher mobility and benchmark various practices. LUT's Brussels Office supports cooperation and impact with EU actors and participation in the UnILiON network's activities.

LUT contributes to several national research networks and associations (e.g. Finnish Water Forum) and educational networks (e.g. FITech). Regional activity concentrates on the regions where LUT's campuses are located. The university has a key role in regional development together with the local cities, the LAB University of Applied Sciences and other public actors. LUT cooperates with local companies daily and is part of regional networks such as the Greenreality Network and Saimaan vesiensuojeluyhdistys ry.

Alumni – the priority partners

According to multiple surveys, LUT's alumni – both on MSc and DSc – strongly identify with the LUT community and actively collaborate with LUT. Many LUT alumni act in the administration of the university, in the University Board and in the University Advisory Board.

The role of alumni as mediators or partners in research projects is remarkable. They are visiting lecturers on courses and offer real-life course assignments or final thesis topics to students. Alumni have proudly marketed their own degree programmes to applicants and actively recruit new graduates to their employer organisations. The annual alumni survey results are used both to follow the careers of alumni and to develop education. However, LUT's procedures to utilise the alumni potential and guard their interests need to be systematised. The target is to create processes, services and an infrastructure which enable alumni – both Finnish and international – to professionally participate in the education and research at LUT.

Strengths	Enhancement areas
Innovative organisational culture with a low hierarchy	Strengthening key account management procedures
Students as co-workers to increase the impact of the university	Strategic development of alumni activities
Variety of means to support companies	External and internal research communication

2.3 Promoting renewal through the organisational culture

- Auditointiryhmän arvio

Organisational culture supporting innovation and collaboration

Based on interviews and workshops during the audit visit, it is clear that LUT fully lives up to its core values of ‘Courage to succeed’ and ‘Passion for innovation through science’. The organisational culture is open and sharing. There is a strong community spirit and collaborative atmosphere that cuts across department and school boundaries and embraces management, staff, students and stakeholders alike. The audit visit clearly manifested an entrepreneurial ‘can do’ organisational culture in which new ideas and innovations are encouraged within the university and with partners. There is a desire to solve things together as well as a will to improve and go further. There were various examples of activities, some of which are also listed in Section 2.4, building on co-development, innovation and research with partners, local businesses and students. The interviewed stakeholders said that LUT is easy to approach, agile and a university with good culture and people. It was mentioned that there is a short way from idea to implementation at LUT. LUT works actively to maintain and develop a creative campus atmosphere, e.g. by initiatives such as the idea box for suggesting ideas, meetings for pitching ideas and the J. Hyneman Center, where students can create different prototypes. A new initiative, LUT Oivallus, is a small team helping staff in accomplishing their goals and trying new ways to perform, e.g. through testing, prototyping, facilitating and using service design methods. Among others, LUT Oivallus has worked to help researchers to create more impact for their research or improve company partner experiences. However, it was noted by some interviewed staff members that more channels for sharing within LUT and collaboration between departments are still needed. There is collaboration with students on many levels, but there is still room to further engage students in development projects that relate to undergraduate and postgraduate education. LUT is also aiming for stronger internationalisation and a more international campus. Therefore, it is important for LUT to keep its international staff and students in mind in all its activities.

The strategic orientation of LUT is also reflected in its partnerships

The university wants to invest in long-term strategic university partnerships in research and education and with companies. As described in the interviews, the university tries to find good matches with top universities to support a high level of research and education in its profile areas. One such example is the Polytechnic University of Milan, which was the university’s benchlearning partner in this audit (see Chapter 5). LUT also seeks collaboration in which it can join efforts and get expertise to complement its own. The university has long experience in programme partnerships and double degrees. Unsuccessful partnerships have been terminated.

The university clearly seeks added value, especially partners that support the achievement of its strategic goals. It was noted during the interviews that one challenge for LUT is the management of its partnerships and that more long-term partnerships are needed. Many of the contacts are personal, making them vulnerable to staff changes, and there may also be too many requests for some academic staff members. The strategic partnerships and customer relations system are some mechanisms applied to improve these issues. The representatives of strategic company partnerships described in interviews a deep cooperation with LUT, comprising many levels of the organisation and both research and education. In some cases, the research collaboration was so integrated that the company representative could not draw a line between LUT's research and the company's RDI. The dialogue in the partnerships is systematic, and the partnership concept appears as a win-win collaboration for both parties. Interviewees also highly valued that the university does not only focus on global impact but also has different mechanisms in place to actively connect with small and medium-sized businesses. One such example is the corporate outreach team, Firmatiimi. The university's role in the region is vital as underlined in interviews, and there are close connections between LUT and the local cities.

LUT has been one of the first universities in Finland to start a consortium with a university of applied science. The LUT group includes LAB University of Applied Sciences with which LUT has shared support services, information systems and a growth strategy. As described in the interviews, new ways to collaborate and find synergies that benefit both parties are constantly sought after. LUT also has deep cooperation with the Finnish technological universities and the University of Helsinki.

LUT reaches out to all its alumni with a feedback questionnaire within five years after graduation. LUT provides networking and other services to both alumni organisations and alumni. LUT hosts alumni seminars and an alumni day is planned. The threshold for participating is kept low. LUT's improvement targets for the alumni field include the development of alumni resources, programme-level alumni feedback and alumni participation in the implementation of studies.

LUT is a relatively small university and takes full advantage of its size and the combination of technology and business. With a clear direction, systematic approach and with activities and mechanisms directed at different target groups and levels, LUT succeeds in engaging and creating impact at the regional, national and international levels.

2.4 LUT's examples of successful enhancement activities

- Korkeakoulun itsearviointi

Research platforms

Research platforms, introduced in 2015, aim to implement the LUT strategy, support cooperation between LUT schools, promote excellent and creative research, collaborate and network with the best possible partners at LUT, in Finland and abroad, seek out external funding actively, and increase the societal, economic and industrial impact of research. The 2015-2020 platforms have successfully enhanced internal cooperation between researchers from different units as the Research and Impact Assessment (RIA) in 2019 showed. Based on RIA panelists' recommendations, the second internal call for proposals for LUT's research platforms was launched in 2020. The applications were sent to external evaluators, all members of LUT's RIA 2019 panel, and the applicant teams were interviewed by a group of experts led by LUT's Vice-Rector for Research and Innovation. The board made the decision to fund platforms based on the rectorate's proposal. The new platforms will start operation at the beginning of 2021.

Collaboration with companies

LUT bases its corporate collaboration on joint research activities and the commercialisation of innovations, involving students, alumni, and investor and enterprise networks. The key customer-based approach to strategic business partnerships, introduced in 2019, helps foreign and Finnish collaborators, including firms and municipalities, to e.g. invest in jobs in Finland. Recent showcases of collaboration:

- LUT and The Switch, which is part of the Yaskawa Electric Corporation, have agreed to develop next-generation power electronics technology.
- LUT and Wärtsilä have an agreement on strategic power system modelling with the aim of understanding and developing paths towards 100% renewable energy systems.
- LUT and a group of firms and municipalities (e.g. Kemira, Neste, City of Lappeenranta) have started a feasibility study on a pilot production plant for synthetic fuel, targeting to produce carbon neutral fuels for transportation.

Commercialisation of research results

Established in 2017, the university's own business development and start-up acceleration unit Green Campus Open (GCO) and the investment company Green Campus Innovations Ltd. (GCI) support the commercialisation of research results. GCO develops new start-ups from LUT research, the LUT Group's applied research and corporate spin-offs and generates deal flow for GCI and other investors by coaching entrepreneurs in building business plans. GCI invests in new

ventures mainly in LUT's profiling areas. GCO supports research teams in funding applications following the innovation process it has developed. The idea is gradually to develop the commercialisation of research results towards a working business models. Business Finland has applied LUT's process in preparing funding applications with other universities. With the help of GCO, since 2012, LUT's research teams have received more than € 20 million to turn ideas into business. LUT's success is based on its strong IPR portfolio and evidenced by a number of inventions and spin-off companies established each year.

Hyneman Center

In 2018, LUT inaugurated a rapid prototyping laboratory, the J. Hyneman Center (JHC). It is a well-equipped workshop for testing ideas, collecting evidence, and increasing skills and knowledge. The goal is to create new ideas and give resources to building and testing prototypes. JHC brings together students, LUT researchers and companies to solve problems in creating and testing prototypes. The proto laboratory was designed together with LUT's honorary doctor, Product Developer Jamie Hyneman, who collaborates with LUT regularly. Every year, more than 500 students take the orientation exam required before starting work at JHC. A common practice is to do assignments at JHC on LUT courses, and many theses are completed in JHC projects. Prototypes are made based on companies or students' own ideas. JHC encourages students to develop their ideas in an annual programme, and in a spring seminar, students present their ideas and prototypes. A few innovations have emerged, and prototypes made at JHC are being made commercially available.

Sustainability activities

From 2013, LUT has invested in an environmental management system, which has developed from a standard (ISO 14001) driven system to procedures that focus more on the sustainability impact of LUT students, personnel and prioritised stakeholders. According to its current strategy, LUT will take a more ambitious role in building a sustainable future on Earth. The Junior University (JU) is an example of responsible cooperation with external stakeholders. As a part of schools' curriculum, it teaches primary and upper secondary school students and teachers sustainability. JU activities reached over 10 000 people during the years 2018–2019. The International Sustainable Campus Network awarded JU as the best sustainable development cooperation model in 2020.

3 HEI enhances quality and well-being

- Auditointiryhmän arvio

Evaluation Area III assesses the functioning and development of the quality system and how the system is used in strategic management. The procedures used to support the competence development and well-being of the staff are also assessed.

Based on the audit team’s evaluation, Evaluation Area III is at the level excellent.

The audit team identified the following as key strengths and recommendations:

Strengths

- The quality system is well-designed and communicated and covers the institution’s core duties.
- The strategic agenda is well known among staff and supported by the quality system.
- The quality culture is open and inclusive.

Recommendations

- The quality work can benefit from increasing the systematic dissemination of good examples to all parts of the university.
- Existing practices for ensuring a close connection between research and education should be more visible in the quality system.
- The international students should be involved to a greater extent in the university's quality work.

3.1 Using the quality system in strategic management

- Korkeakoulun itsearviointi

Quality management and strategic management have the same target

The purpose of LUT's Quality Management System (QMS) is to support the achievement of the university's strategic goals and to assure the high quality of the university's operations and results. The QMS supports the university management and ensures the continuous development of its functions in accordance with the university's quality policy and the PDCA cycle. The QMS is described in the quality manual published on the LUT website. The LUT intranet contains more detailed information on the QMS for internal stakeholders. Both the LUT website and intranet will be renewed in the near future: the website in 2021 and the intranet in 2023-24.



Figure 7. The interaction between quality and strategic management

QMS promotes the evidence based development of core functions

The quality management system supports the performance and continuous improvement of the university's core functions by ensuring that their goals, responsibilities, instructions, monitoring procedures and results are defined and communicated in a way that serves both internal and external stakeholders. The monitoring and analysis of the performance of core operations have been significantly strengthened in recent years at all organisational levels of LUT, providing a solid basis for strategic management and the continuous improvement of core functions.

For example, LUT has developed a programme portfolio with several digital master's programmes based on the results of student admission and progress. LUT has also promoted the release of high-quality research publications through intensive monitoring of publishing activities and an incentive system for researchers. The challenge of monitoring performance is the fragmentation of information and information production, for which a data warehouse project has been launched in 2020.

Strategy work relies on information produced by QMS

Strategy work has a significant role in the administration of the university. It has defined the university's profile among international research universities and how LUT pursues its goals. For the preparation of the strategy, the information produced by the QMS has been crucial e.g. in profiling the core scientific competence of LUT's researchers and providing information on the performance of core functions, stakeholder feedback and external evaluations. The Research and Impact Assessment in 2019 provided an important background for strategy work.

Strategy work is an example of continuously developing processes. In the latest FINEEC audit, LUT received critical feedback concerning the communication of strategic action plans. On the strategy round in 2020, communication was taken into consideration more thoroughly.

Internal communication and supervisors in crucial role in strategy implementation

Strategy communication has been one of the top priorities of LUT administration. On the preparation phase, a strategy survey, workshops and blogs on the intranet made the ongoing strategy work visible to all. Once the new strategy was confirmed by the board, it was communicated in many ways, e.g. in unit specific strategy sessions. Supervisors of teams are in a crucial position in discussing the strategic goals and their implementation in the team. Performance and development discussions between top management and schools and between employees and supervisors ensure that the unit/team and each of its members observe the strategy. Strategy implementation is also supported by the internal funding model. Since the

university now operates on two campuses, it has been recognised that the visibility and communication of administration needs to be strengthened on both campuses.

QMS supports the implementation of the strategy

Quality management supports strategic management by integrating the strategic goals into the QMS. New operating models established through strategic development are included in the university's normal operations, and the responsibilities, guidelines and evaluation procedures are defined as part of the QMS. In the previous strategy period, for example, the research platform process and the operating and evaluation model of an entrepreneurial university were developed and established. Since 2010, the internationalisation of the university has been an inclusive strategic aim and profiling target. The QMS has supported the development through international accreditations in education development, participation in international university rankings, and a bilingual intranet.

Strengths	Enhancement areas
A concise and focused strategy based on intensive competence analysis	Strategy communication in the transition to a dual-campus model
A close link between strategy work and quality work	Availability of relevant and applicable monitoring information in a changing operating environment
Addressing emerging development needs and seeking new solutions	Data warehouse to improve foresight by combining, analysing and utilising data from different sources

3.1 Using the quality system in strategic management

- Auditointiryhmän arvio

The quality policy forms a common basis for quality work

LUT's quality system is public and easily accessible on the university's website and intranet. The principal structure of the quality system is based on W.E. Deming's improvement cycle (Plan-Do-Check-Act), which lays a good foundation for systematic work and provides opportunities for organisational learning.

The quality system is aimed at internal stakeholders and has been updated regularly in recent years. Available in both Finnish and English, the quality system as a whole is structured in a commendable way. Nevertheless, the audit team recommends that existing practices for ensuring a close connection between research and education should be more visible in the quality system.

The university's quality policy is public and relatively concise. The policy relates to the university's strategy and starting points that are judged to be central in the quality work. The policy fulfils its main purpose as a common basis for quality work.

The quality system provides good support for the achievement of LUT's goals

The university's strategy (LUT Strategy 2030) is formally owned by the University Board and has pronounced focus areas—energy, air, business and water—which constitute a clear profile for the university's activities regarding education and research. During the audit visit, it became clear that the university's management works purposefully to communicate the ongoing strategy work on various levels.

Associated action plans, financial plans and quantitative targets are available on the university intranet, which promotes transparency and participation of all members. The university's three strategic action plans increase concreteness by specifying actions, division of responsibilities and indicators for several different strategic areas. As for strategic ambitions, the university has communicated these both internally and externally, which was also confirmed during the audit visit. It also turned out that many staff members heard during the audit visit, not only those active in education and research, express a sense of belonging to the university's profile and can identify with the university's strategic ambitions.

Regarding the amount of quantitative information (e.g. indicators) that the quality system generates, the audit visit showed that data is used extensively in operations management (for

example, in the three schools) and that the quality system is valuable in that context. The audit team believes that the university could further strengthen its strategic management by using information from the quality system in order to regularly discuss foresight and long-term issues in various management forums.

Based on available documentation, information from the university intranet and audit interviews, the audit team concludes that the quality system generates useful information, which is systematically analysed and used in management and other levels and thereby supports the university’s profile, the achievement of its goals related to the institution’s core duties, and the implementation of the university’s strategy.

3.2 Supporting the competence development and well-being of the staff

- Korkeakoulun itsearviointi

Competence development based on the strategy

LUT's strategy and action plans steer the professional development of staff. The goal is to keep improving the work atmosphere and well-being of the staff and to highlight the importance and competence of every staff member as part of the whole.

A four-level tenure track is applied to academic positions at LUT. Researchers and teachers are employed either in a tenure track position or a non-tenure track position. Both systems have fixed targets and criteria for advancement from one level to the next. Thus, the academic staff knows in advance the priorities of their professional development. The tenure track committee ensures the uniformity of this system.

Annual development discussions are an important means to identify and record development needs of staff competence. When organising in-house training, feedback is collected and people can express their wishes for future trainings. Teachers receive ideas for their professional development in regular course feedback surveys. LUT staff also has the possibility to express their development wishes in many feedback surveys.

Heads of units and supervisors best know the expertise available in their unit and the need to develop it. They assess the professional expertise of their team and see to its development together with the employees themselves.

Training for different staff groups

Based on the strategic emphasis and expressed needs, LUT annually compiles a personnel and training plan. Researchers develop their scientific competence by joining various networks and building connections in international scientific conferences. As teaching increasingly takes place online, LUT has invested in pedagogical and technical skills and support for the teaching staff. Teaching staff can also develop their pedagogical skills in LUT's university pedagogy training. Supervisors are regularly offered an opportunity to take part in coaching groups led by an expert. The skills of managers will be enhanced by providing needs-based training.

Language courses, IT courses, occupational safety training and first aid training are available for all employees, and the whole training plan is available on the intranet. Furthermore, each unit may enable its employees to take part in training outside the university. LUT supports the professional development of its personnel by allowing them to take two lessons per week for

independent study or a longer study leave.

Open, transparent and merit-based recruitment

LUT applies an open and international application process in recruiting personnel for teaching and research positions to reach a wide range of competent applicants. Recruitment channels are tailored to the position and selected by the recruiting unit. The open international application process is applied to all tenure track positions, but direct recruitment is sometimes used to ensure the hiring of the best talents. According to LUT's strategic action plan, the gender balance is one criterion to be considered in academic recruitments. Selection is always based on the merits, competence and skills of candidates. To secure a transparent and justified selection, external academic experts evaluate top candidates to tenure track positions, in addition to the evaluation done by an internal selection committee.

Staff's well-being contributes to the achievement of university targets

One of the basic factors of well-being at work is flexible working time arrangements for all LUT staff members. LUT promotes family-friendliness by taking into account the different life situations of employees and, for example, enabling part-time work. LUT has a positive attitude towards remote work. Based on the experiences during the covid-19 pandemic, LUT offers diverse support for remote employees (e.g. technical support and virtual workouts) and for maintaining a sense of community in telework.

To support coping at work, the university offers its employees recreational Happiness through Health activities on both campuses. Occupational safety groups ensure a functional and safe work environment for all. LUT provides its employees with modern and diverse occupational health care services. Early support for the capacity to work promotes workplace well-being, identifies possible threats to working capacity and enables timely interventions.

LUT conducts a workplace well-being survey every other year, and a monthly employee mood tracker monitors employee well-being more frequently. Their results are used to improve the working conditions and well-being of employees.

At home on all campuses

LUT's strategic goal is to treat all members of the university community equally. The UN Declaration of Human Rights is the foundation for operation on the campuses. Everyone working and studying on our campuses must respect it in their daily lives. The equality of LUT community members is supported by a regularly updated equality plans for personnel and students.

Open communication is one factor in enhancing equality. On the LUT intranet, all staff members can ask or comment on matters in the LUT Stream. As LUT's scientific community becomes more and more international, the wider parallel use of English in internal communication

is encouraged. LUT staff is encouraged to participate in the development of the university through e.g. surveys and open feedback channels.

Strengths	Enhancement areas
Strategic commitment to the development of staff well-being	Shared operating models on both campuses
Diverse Happiness through Health activities	Closer follow-up of development discussions
Flexible implementation of and support for remote work	Support for the integration of foreign employees and their families

3.2 Supporting the competence development and well-being of the staff

- Auditointiryhmän arvio

LUT has functioning routines for identifying the competence development needs among staff

The audit team notes that recruitment and competence development are strategic issues for the university. LUT has a recruitment policy together with LAB University of Applied Sciences that regulates the starting points and processes for the recruitment of staff. The ambition is that the recruitment work is open, transparent and based on merit. The policy is also available on the university's website. Furthermore, the university encourages the majority of positions to be advertised internationally, which is applied to all tenure track positions. This is commendable and in line with the university's ambitions to strengthen internationalisation. The strategic action plan requires that gender balance should be promoted in connection with academic recruitments. In summary, the audit team notes that the procedures for staff recruitment are clear, accessible and transparent.

The university's tenure track system includes competence development with clear targets for teachers and researchers. The target of the tenure track positions is to advance to the level of full professor based on post-doctoral achievements and qualifications. Non-tenure track positions are either research- or teaching-oriented, based on the needs of the school. The tenure track committee ensures that the system is applied and that related procedures are uniform in quality and content. The audit team's impression is that the tenure track system works well and is appreciated within the university.

Based on the interviews and available documentation, the university has functioning routines for identifying development needs for staff competence and for supporting the development of staff competence. This applies to all staff at the university. Here, the audit team would like to specifically mention that teachers are actively encouraged to obtain pedagogical training of at least 25 credits or even take the vocational teacher training degree. The annual development discussions are applied so that they achieve the purpose of identifying and recording development needs of staff competence. Competence development within successful academic leadership will become increasingly important in the coming years. This is a challenge that is shared by many universities, and the university is aware of it.

There is a systematic approach in supporting staff well-being at work

The interviews confirmed the impression that the university has a clear focus on the well-being of staff, both in terms of follow-ups and through activities such as ‘Happiness through Health activities’. The university’s ambitions regarding well-being are exposed in various ways within the university. The well-being issues have a prominent position in the university’s quality work, for example, through a workplace well-being survey every other year and the anonymous and monthly measurements through the ‘employee mood tracker’ the results of which are available on the university intranet. The overall impression of the audit team is that the follow-up routines regarding well-being mainly work well. At the same time, the mood tracker system generates relatively blunt information that makes in-depth investigations necessary to find out the reasons for any changes.

According to the LUT Quality Manual, the rector is ultimately responsible for ensuring that all members of the university community are treated equally and in accordance with the UN Universal Declaration of Human Rights. The LUT Group Equality and Non-Discrimination Plan gives the impression of proactive and systematic work that is accompanied by a division of responsibilities and follow-up activities. The interviews during the audit visit confirmed the positive impression.

3.3 Functionality and development of the quality system

- Korkeakoulun itsearviointi

QSM integrated into LUT management system supports continuous improvement

The quality management system covers all the university's core operations. It assures that the development targets are recognised and university activities continuously improved. In accordance with the PDCA cycle, the university takes care of

- high-quality goal setting and communication of strategic and operational goals (PLAN)
- common operation models based on shared instructions, guidelines and established procedures (DO)
- intensive and systematic performance monitoring, stakeholder feedback systems, internal and external evaluations (CHECK)
- clear responsibilities and effective decision-making processes enabling the definition and implementation of development priorities (ACT).

Research platforms and sustainable development activities are examples of continuously developed procedures that affect all university units.

Good practices are introduced, refined and applied

The university boldly tests and implements new solutions. Solutions that have proven to work advance into joint discussions, decision-making, possible further elaboration and wider use. Centralised university services contribute to the dissemination of good practices by harmonising support service processes and instructions. Examples of the dissemination of good practices to the entire university are LUT's open science practices and guidelines, degree programme feedback workshops, and Happiness through Health activities originally developed by the LUT Group partner Saimaa University of Applied Sciences. If needed, the university also has the courage to give up practices that no longer provide the desired added value. Internal QMS audits, project partner feedback surveys and the societal interaction steering group are examples of procedures that have been replaced.

Quality culture built by everyone in the LUT community

From the very beginning, the underpinning idea has been to incorporate quality management and continuous improvement into the normal activity of the university. Aligned with that idea and LUT's quality policy, all members of the university community – both personnel and students – bear quality management responsibilities related to their position.

The university's quality culture is based on the university's values – especially on the courage to find new ways of working open-mindedly. The atmosphere at the university is open and the administration easy to approach. All university community members are invited to participate and influence through various channels, e.g. strategy and audit surveys, open discussions on LUT's intranet stream, open feedback and proposals, and a monthly mood tracker.

The student guilds and student union guard students' interests and, if needed, bring issues up with degree programmes or the university management in regular meetings. Course feedback is one of the most important student feedback channels and students are encouraged to give it, as it significantly influences the development of courses. Student guilds play a key role in collecting and processing course feedback in all degree programmes.

External stakeholders are invited to contribute to university activities and development in many ways. Research project partners participate in planning the project in steering group meetings, and thesis employers in the implementation of theses. The University Board and Advisory Board have an important position in the university management. LUT's professors of practice and many other representatives of external stakeholders participate in the university's activities, e.g. through the Junior University and Firmatiimi activities.

QMS in operation and under continuous development

LUT's QMS works well when the university meets its objectives and is able to develop its functions continuously. LUT has improved its performance by several indicators, e.g. research activities and attractiveness of degree education. At the same time, the operational environment is changing fast and the objectives are to be revised more often. That sets requirements for the QMS, which is continuously developed in close interaction with the functions of the university.

The QMS meets its objectives by being both systematic and flexible. It ensures the systematic implementation of procedures while being revised according to the changes in the operational environment and university functions. The QMS, described in the regularly updated quality manual and on the LUT intranet, has been developed based on

- strategic development
- development of university functions
- good practices disseminated into wider use
- international quality standards applied at LUT
- feedback from external assessments
- requirements of external stakeholders, e.g. MoEC.

For example, doctoral education procedures, monitoring and support of the progress of studies, and career services have been revised according to the latest FINEEC audit recommendations. The Steering Committee of the Quality Management and Environmental Management Systems headed by the Vice-Rector for Education is responsible for the

development of the QMS and update of the quality manual. The University Rector finally approves the amendments of the QMS.

Strengths	Enhancement areas
Quality management as part of everyday activities at the university	Strengthening the role of external stakeholders in LUT operations and development
A goal-oriented organisational culture supporting quality management	Scattered monitoring data and data availability still largely based on manual work
Commitment to external evaluations to ensure continuous improvement	Decision-making documentation not yet comprehensively transparent and available

3.3 Functionality and development of the quality system

- Auditointiryhmän arvio

The strong integration of the quality system into the management system contributes effectively to the university’s development

The quality system covers the university’s core duties and includes prerequisites, responsibilities, routines and processes for quality assurance, assessment and quality development of education, research, societal interaction and university services.

Based on the audit visit, the self-assessment and the information available on the university’s intranet, the audit team concludes that the quality system is ‘alive’ and not a pure administrative product. The university has demonstrably translated the four phases of the PDCA cycle into practical action in the majority of the university’s processes. The quality work is characterised by well-described systematics—goal-setting and communication of goals, clear areas of responsibility and routines, description of monitoring and feedback systems (e.g. via the intranet feedback channel) and decision-making processes and the implementation of development priorities.

Important parts of the quality system are the university’s routines for internal and external assessment and benchmarking, which also include the international research assessments. Here, the university’s work with international accreditations also contributes to the quality assurance and development of a significant number of degree programmes. Furthermore, the audit visit confirmed that the application of the quality system makes it easier for the university to identify development needs in a goal-oriented way.

LUT’s quality culture is open, inviting and participatory

During the audit visit, the university’s quality culture was often expressed in terms of “improvement culture” and the desire to constantly improve, and that this is a culture that permeates all the university’s activities. The quality culture was often referred to as the university’s values and the fact that the quality culture was strategy-driven. It was clear that the quality culture could be linked to the staff and students’ commitment to the university’s profile and strategic development. The general commitment to the quality work and the strategy could not be interpreted by the audit team in any other way than that the quality culture is inviting, participatory and open to both staff and students. On the other hand, the university could stimulate and utilise the commitment even more by systematising the work of sharing and discussing ideas and good practices within the higher education community. Furthermore, the audit team recommends that the university to a greater extent involve the international students

in the university's quality work, as discussed in Section 1.1. If LUT aims at attracting more international students, especially for long-term stays in Finland, HEI should more actively encourage this group to participate in shaping their educational institution as well, which could also make integration in Finland easier. The university should enquire systematically about the reasons for the non-participation of international students and act according to the results.

External stakeholders could be more involved in the evaluation and development of the quality system

The maintenance and development of the university's quality system is the responsibility of the rector together with the Steering Committee of the Quality Management and Environmental Management Systems. The quality system is intended to operate for a long time and has so far been updated several times in accordance with operational changes and new external recommendations, such as the latest FINEEC audit recommendations. The quality system as a whole is developed by taking part in FINEEC's recurring national evaluations. The university could, to a greater extent, involve external stakeholders in the continuous development of its quality system.

All in all, the audit team was in many ways impressed by how LUT works in a systematic and target-oriented manner and how it engages its staff, students and stakeholders in the development of the university. LUT knows what it wants to achieve and how, how to measure its success and use the information to further improve its activities.

3.4 LUT’s examples of successful enhancement activities

- Korkeakoulun itsearviointi

LUT intranet

LUT’s intranet is the online quality manual for LUT personnel and students. It contains detailed quality management documentation for internal stakeholders. The documentation is in both Finnish and English, ensuring sustainable internal communication that serves all LUT community members. The information structure on the intranet has been designed according to the LUT QMS, including e.g. information on the main functions, their objectives, people responsible, instructions and assessment as well as support services. The intranet front page serves as a common information and communication forum where all topical issues are shared. Anyone can post a message on the LUT stream and give anonymous feedback in an open feedback channel. All the feedback will be responded to regularly on the intranet. The intranet is managed by the intranet team, and it is developed continuously to better serve the internal stakeholders’ need for information and based on changing operations.

Happiness through Health activities

LUT supports the physical, psychological and social well-being of its staff through Happiness through Health activities. The activities are mainly free of charge activities and include e.g. different clubs, fitness classes, office workouts, and welfare coaching individually or in a small group. The activities are usually arranged just after working hours on the campuses. Due to the pandemic, the sports activities take place online. For example coffee break workouts have received much positive feedback, and many of these online operating models will continue. An annual feedback survey steers the development of the activities.

Employee mood tracker

The employee mood tracker is an anonymous survey on LUT employee moods, applied at LUT since 2015. It is repeated monthly, giving employees a regular possibility to give feedback on any work-related issue. The survey asks to rate the mood of the day on a scale of 1 to 5 and gives an option to comment further. The survey allows top management, deans and heads of units to follow how staff members experience their work. The university level results are summarised on the intranet, and supervisors receive a report on their own unit and communicate the results with their team. The mood tracker enables supervisors to follow the development of employee moods and take action as needed.

Tenure track for researchers

LUT has applied a four-level tenure track for researchers since 2016, when the first tenure track positions were filled. The tenure track offers a clear and systematic career path for researchers and supports their continuous competence development. The university commits to researcher's advancement in stages, provided that the researcher succeeds in the LUT performance evaluation. All tenure track recruitments involve an open international application process. The tenure track recruitment requirements and process, tenure track levels and advancement criteria are communicated to applicants. During the recruitment process, all the applicants are actively informed about the progress of the process and decisions.

LUT is commitment to promoting the principles of the European guidelines that support the continuous development of the university as a working environment especially for researchers. The European Commission gave LUT University the HR Excellence in Research award in 2013 and renewed it in 2019.

External assessments supporting continuous development

LUT is committed to seeking and utilising views of external, preferably international experts to improve its operations and performance and to increase the transparency of university activities. The functioning and impact of the university's quality management system has been evaluated regularly by FINEEC. An international research assessment has been conducted twice, in 2012 (Research Assessment Exercise, RAE) and 2019 (Research and Impact Assessment, RIA), to assess the quality, impact and potential of scientific research at the university. International assessments of research also take place in LUT's internal research platform application processes and in the European Commission's HRS4R process. To develop the international comparability, recognition and quality assurance of degree programmes and schools, the university has applied for international accreditations as of 2011. The LUT School of Business and Management has committed to an institutional accreditation process to support comprehensive quality assurance and development at the school. The university participates in rankings, which provide the university with valuable benchmarking information with regard to key partners and competitors.

4 HEI as a learning organisation

- Auditointiryhmän arvio

Evaluation area IV assesses an area selected by LUT where it wishes to receive feedback for the enhancement of its activities.

The audit team identified the following as key strengths and recommendations:

Strengths

- The whole university community acknowledges the benefits of digital tools and there are, especially among teaching staff, clear ideas and plans to maximise their potential.
- LUT has forecast the development of society in terms of digitalisation needs, and the transition from on-site to online teaching and learning has been quite smooth in most of the cases.
- LUT offers the teaching staff a wide range of opportunities for enhancing their online pedagogical strategies and teaching skills.

Recommendations

- The university should find a balance between online and on-site teaching and learning, while taking further steps to bring social interaction into the digitalised process.
- The university should ensure the communication of follow-up results and the action plan for the current Digitalisation Strategy under review due to the rapid changes during the pandemic so that its improvement would be based on these results.
- The university should ensure a balance between teaching and research activities for the teaching staff in order to offer them time for the continuous improvement of online teaching methods and skills.
- The university should ensure a unitary approach for delivering courses in the digital format.

4.1 Digitalisation in teaching and learning

- Korkeakoulun itsearviointi

Strategic steering of digitalisation in education

In 2017, LUT launched a digital education strategy for 2020 to increase digital education as the first university in Finland. The strategy has been updated to reach the year 2025. The long-term goal is to make LUT's higher education services and products globally available via digital tools.

The collaborative strategy processes were chaired by the Vice-Rector for Education. In the first strategy version, concrete targets were set for courses, video materials and electronic examinations, and the outcomes were systematically monitored, while the renewed strategy aims to develop showcases in online education (so called diamond products). The first strategy version was concrete and easy to implement, while the second is abstract and requires more active work from schools and degree programmes. Due to the pandemic, the digitalisation of all modes of education was prioritised and the strategic objectives have not been implemented as planned. Moreover, the strategic objectives for digitalisation need to be reviewed in the near future in accordance with the rapidly changing situation.

The theme of the evaluation area was chosen by the Steering Committee of the Quality and Environmental Management System because LUT has prioritised it as a development target for several years. The audit's self-assessment and external evaluation are expected to serve the future development of university education and the strategic steering of digitalisation – also post-pandemic.

Online education at LUT

In the academic year 2020-21, LUT is offering seven online MSc programmes, 27 continuously open online courses in BSc and MSc programmes and several online courses in continuing education. Innovative virtual tools (e.g. virtual laboratories) are in use on some courses, and MOOCs for the general public are being developed in LUT's strategic focus areas. In 2016, LUT started its first online MSc programme to increase the accessibility of engineering education. The online programmes have provided highly valued possibilities to teach and study independent of place and time. For teachers, the change in pedagogy has been more difficult and time consuming than expected, and scheduling the studies individually is typically a challenge for students. In an online environment, students need to be more proactively supported to keep good pace in their studies and to avoid dropping out. Especially the integration of first-year students into the university community is a challenge in online studies.

In spring 2020, LUT transitioned to distance learning due to the pandemic. Thus, the digitalisation

of teaching and learning has taken a huge leap, requiring extra work and agility from teachers, students and support staff. The accessibility of teaching and equality between students in different locations was improved, but interaction on courses, independent study skills and student motivation were recognised as challenges by teachers. First-year students' specific needs were taken into consideration and intensive orientation was organised in autumn 2020.

Student feedback is important in developing the digitalisation of education. In spring 2020, course feedback remained mainly at the same level as in the previous spring even though teaching was now fully online. This shows that the digital infrastructure and skills of teaching personnel are relatively good. However, the need to update teachers' pedagogical competences in an increasingly digital learning environment has been recognised. Also, a tendency to overload students with work on online courses is a challenge which requires thorough and co-operative planning.

LUT opened its campuses for the autumn semester 2020 and recommended hybrid teaching to enable collaborative learning and on-site meetings for students and teachers. A comprehensive student survey proved the decision successful. Students have been relatively satisfied with the progress of their studies, quality of teaching, availability of help, and possibilities to study independently, meet student peers and study on campus. Supporting students' sense of community, strengthening study guidance and feedback to students on their learning are the main challenges to tackle in digitalised teaching. Standardising online courses and raising the overall pedagogical quality of online education are targets for development.

Support services for digitalisation

LUT has provided support services for online education as of 2001. In 2012, the digital learning team started with one person. In recent years, this support service has been strengthened remarkably, having now 10 experts serving both LUT and LAB personnel. Most of the digital learning team members have a teacher's qualification besides their main higher education degree. The team gives guidance on pedagogical issues in teaching and learning and maintains and supports centralised data systems for teaching and learning from one place.

LUT schools appreciate and utilise the services the team provides. However, the supply and demand fail to meet in some situations. Timely information about training programmes does not reach targets groups despite the existing demand. It also seems that staff is better aware of assistance in teaching technology issues than pedagogical support although the team offers 25 ECTS credit university pedagogical training and many short courses in pedagogy. Dialogue between degree programmes and the team and sharing good practices have been recognised as development targets. In autumn 2020, collaboration has been strengthened by inviting the team manager to the regular meetings of heads of degree programmes.

Strengths	Enhancement areas
Digital readiness of personnel and students	Raising the pedagogical quality of digitalised teaching
Strategic steering for digitalisation of education	Strengthening communication, interaction and a sense of community in digitalised education
Pedagogical and technology support by digital learning team	Systematised monitoring of digital education

4.1 Digitalisation in teaching and learning

- Auditointiryhmän arvio

One of the reasons indicated by LUT for selecting digitalisation in teaching and learning as an evaluation area of the audit was its desire to learn more about teachers' and learners' views on how digitalisation affects university education and how digitalisation changes university education, pedagogy, studying and learning. The university also wants to learn about supporting and managing change in order to create high-quality competences for the future world of work. During the audit visit, digitalisation in teaching and learning was discussed in interviews with various groups and in workshops with teachers and students.

Strategic development of digitalisation prepared LUT for online teaching and learning during the pandemic

By creating a Digitalisation Strategy for the timeframe 2017–2020, LUT has forecast the development of society and the role of digitalisation in the internationalisation process. The university has acknowledged that in order to become more accessible for international students and staff, the university has to offer a wide variety of online degree programmes together with open courses. The 2020 Digitalisation Strategy aimed to have an approximately equal number of degree programmes and courses delivered online by all three faculties, thus showing consistency in the strategy development process as a whole. The Digitalisation Strategy 2020 helped LUT with resources for online learning, and the current Digitalisation Strategy 2025 will represent an important step to consolidate digital teaching and learning, taking it from emergency to high-quality online education. It was recognised during interviews that the digitalisation of higher education brings both opportunities and challenges in a global market. The management recognised that the most challenging issue in digital learning is to bring it as close as possible to on-site learning in both quality and efficiency.

In order to keep track of the implementation of digital learning and teaching, there has been monitoring in place based on the mechanisms of the previous digitalisation strategy. The feedback on individual courses has been monitored at different levels of the university, and management representatives have had continuous discussions with the student union concerning online teaching and learning, especially during the pandemic. In the workshop, teachers provided several examples of how they had made improvements in their online courses based on feedback, monitoring of students' activities, and results. In general, the whole university community acknowledges the benefits of digital tools, and among the teaching staff in particular, there are clear ideas and plans to maximise the potential of these tools. However, as mentioned below, student experiences also tell about inconsistencies in online teaching and how teachers respond to student feedback.

It is clear that the past year of remote learning and teaching has contributed to the rapid and continuous development of the digitalisation process at LUT and the world as a whole. Thanks to the forecasting of digital needs prior to the pandemic, this transition was quite smooth in most cases. However, this fast pace has required the university to have a consistent follow-up process for the strategy development concerning digitalisation. It was also mentioned by the top management that LUT wants to await further steps and direction when the target is constantly moving. Also, the management did not want to burden the teachers in a situation where many have been struggling during the pandemic. The university representatives acknowledged that the Digitalisation Strategy 2025, which was developed before the pandemic, is outdated, and they are planning to develop an action plan based on the latest changes. The university should ensure the communication of follow-up results and the action plan of the current strategy so that its improvement would be based on these results.

The support provided by the digital support services was highly appreciated

In terms of proactiveness, the university also supports teachers in transferring their courses to the online environment. To ensure the implementation of digital teaching and learning, support services offer continuous learning opportunities for the teaching staff in terms of pedagogical approaches, online teaching skills and digital tools. As mentioned by the representatives of digital support services, they are trying to support teachers in any way they can. Online courses can be tailored with the support staff, and together with them, teachers can find solutions for pedagogical and technical issues in online courses.

Based on the workshops, teachers mentioned several aspects that work well at LUT in terms of the digitalisation of teaching and learning. These were (among others):

- Opetushelp and the digital learning team offer a wide variety of helpful services. They provide valuable support and training on digital tools and online teaching and learning.
- Peer advice and sharing of good practices within and between degree programmes. Doing things together with other teachers and implementing working solutions.
- Challenges with online teaching and learning are discussed in meetings with colleagues. Knowledge of the digital learning team and other colleagues has been helpful in resolving issues.
- Pedagogical training has been essential and has provided good ideas and best practices for teachers.
- Moodle platform for sharing ideas and good practices (one faculty).
- Lots of information available on the intranet.

Services offered by the digital learning team and Opetushelp were widely appreciated by the teachers. Many of the teachers participating in the audit teacher workshop had participated in training related to digital tools and pedagogy. The other support provided by the digital learning

team and Opetushelp had also been used by several teachers. However, accessing this kind of service also depends on individual priorities, motivation and open-mindedness of teachers.

Flexibility in studies is appreciated by students

Since most beneficiaries of online learning were international students until 2020, once the pandemic broke out a year ago, the transition from on-site to fully online learning was new for Finnish students (especially those enrolled in bachelor's degree programmes). The main assets provided by digitalisation for students relate to the flexibility of education. At the audit visit, students mentioned the following positive aspects of online teaching and learning at LUT:

- Quality has remained largely the same as before, though with some variation between courses and teachers. There were also other experiences based on which online teaching is not able to achieve the same level as on-site teaching.
- All necessary information is online. Clear timetables with all important dates are in Moodle.
- Different online learning tools and assessment methods are used in many courses. Fewer exams.
- Good online exercises. Many courses have included videos about the exercise topics. Interesting simulation games have been added to some courses.
- Flexibility in terms of scheduling, studies are not time-bound. Students are better able to combine studying and working.
- Flexibility provided in submitting assignments and tasks.
- Exam room where students can schedule exams to fit their own schedule.
- Motivating to be offered extra points for participation in online lectures
- Most teachers easily approachable and answering well to queries. Requests for help usually handled swiftly, professionally and with the intent to help students. Students have not been left alone. Some exceptions were mentioned.

In terms of students' support for digital teaching and learning, LUT has provided several means to reach students' needs in these uncertain times. There are informal meetings organised on the institutional level—added to the 'consultation' meetings for certain courses provided by the teaching staff—to address the issues brought up by students who might have difficulties in their academic performance. Also, the university library offers online literacy search courses and academic writing courses, especially for students in their last years of studies, to help them with their work for bachelor's or master's theses.

Inconsistencies in the online courses according to students

In times of continuous changes, both from an educational and pandemic-related perspective, the development of online education went at a fast pace. However, some of the challenges in online teaching and learning are not specific to online teaching. Issues that apply to on-site teaching and learning also come up in the online environment.

Students identified the following challenges in online teaching and learning:

- Heavy workload in some courses.
- More variation needed in learning tasks. Some courses always have the same elements.
- Pre-recorded online material has sometimes not been available in reasonable time with respect to assignment deadlines.
- Variation in skills of teachers in using online tools.
- Variation in interaction with teachers.
- Course pages are different, which confuses students.
- Course materials sometimes outdated.
- Sometimes issues with teachers not responding to feedback.
- More online courses could be offered together with other universities.

Based on student views, there have been some inconsistencies in the online approach between courses and individual teachers. As also mentioned in Chapter 1, the feedback loop is not always closed because of the low response rate in course feedback, teacher rotation or non-responsiveness of individual teachers. LUT should look into how variations in teaching and reacting to course feedback could be improved to enhance the overall quality of student experiences.

Teachers need more time for the development of their online teaching

A general challenge recognised by both teachers and student representatives was the insufficient time teachers had for improving their teaching and courses. This is partly due to the focus on research and sometimes administrative obligations added to their teaching activity. Some teachers noted that the salary system with the focus on research does not allow teachers to focus enough on teaching and its development. The audit team recommends that LUT reviews how teachers are given working hours for course development in schools. On the other hand, based on the audit visit, there appears to be encouragement from the management for pedagogical development.

Challenges and some ideas for further improvement, according to the teachers and other staff:

- Variation in how teachers address the need to move to online teaching and challenging to unify the approach.
- Some courses are easier to move online than others.
- Several channels for information for both staff and students (Teams, Zoom, Moodle, email chat groups, etc.).
- Student expectations for quick answers at evenings and weekends. Teachers cannot work 24/7.
- Increasing student numbers and requirements for individual feedback adds to the workload.
- Online teaching is time-consuming. Hybrid models need more resources.

- Participation rates are lower in online teaching, and making students participate is important.
- Addressing the diverse group of students also in the online environment.
- The university should provide support to students in online learning, especially time management and ‘learning to learn’.
- Making online teaching and learning more interactive to involve students.
- Evaluating students properly in an online environment. Some cases of cheating have been suspected. Developing appropriate exam questions that encourage independent responses and reduce the possibility of cheating.
- Low response rates in feedback questionnaires do not support course development. There are new opportunities for students to give more course feedback in an online environment.
- Studies where laboratory work is required are difficult to carry out in an online environment. Development of virtual classrooms and virtual laboratories.
- Not all tools are up to date, and new tools will be needed and with related support.
- More training in digital pedagogy is needed.
- Time for development of online teaching and learning. Time to do online teaching better.
- Important to collect lessons learnt from teachers at LUT.
- More channels to share good practices related to online teaching and learning tools, e.g. in the intranet and making the Moodle platform LUT-wide.
- Learning analytics providing systematic ways of measuring student learning. Clear pathways for students with learning events and checkpoints for teachers to follow the learning and provide feedback.
- Automation of exercises and feedback.

As also discussed in Section 2.3, peer advice, collaboration and sharing of good practices is at a good level at the university. Teachers can share experiences and ideas in seminars and training, meetings and informal discussions. Based on the workshops, it was clear how important exchanging ideas and practices between peers is, and there were several examples of how ideas already tested by colleagues were used in one’s own courses. Ideas and tools in online teaching and learning are also shared and discussed in national and international forums. There is an exchange between the technological universities in Finland. For example, tools and course materials have been shared. Nonetheless, teachers still wished for more channels and forums for sharing experiences across LUT and more training in online pedagogics.

Learning analytics and automation were recognised by staff as an important next step in online teaching and learning. Teachers cannot be available 24/7, so automated assessment and feedback are needed. Automation also provides opportunities for tailoring exercises and feedback for individual students.

All in all, the digitalisation of teaching and learning is a good example of how LUT works strategically and uses its quality system and other functions to monitor activities and then takes actions to improve things. Many of the strengths and challenges related to digitalisation in

teaching and learning have already been recognised by LUT in its self-assessment. In terms of the next steps, the audit team encourages LUT to take full use of the competences and experiences of its students and staff.

5 Benchlearning

- Korkeakoulun itsearviointi

Master’s Thesis in Engineering programmes at PoliMi (Polytechnic University of Milan) and LUT

Benchlearning partner and target

The benchlearning partner was chosen by the LUT management committee in February 2020 based on the strategic aim to strengthen co-operation with prioritised university partners in research and education. PoliMi is a partner with several possibilities to increase the impact of both institutions. The common goal is to design double degree MSc programmes in several fields of engineering to provide possibilities for students to extend their expertise. LUT’s benchlearning target was to support co-operation and building double degree education.

Objectives and implementation

The objective for benchlearning was to exchange information on the practices of the MSc thesis process from the perspective of students, supervisors and programme management. The benchlearning project and the topic were agreed on in the double degree programme agreement negotiations between the two institutions.

The original plan was to arrange on-site visits where representatives of both institutions could meet in person, visit the campuses and laboratories and talk about cooperation in general and regarding the double degree programmes to be delivered together. Due to the pandemic, the start of the benchlearning was delayed, the original plan revised and the scope of topics restricted to cover the most important process that need to be shared when building double degree programmes.

The benchlearning included two online meetings in autumn 2020. In the first meeting, the thesis process was discussed in general. Based on the discussion and information available on websites, the procedures of both institutions were documented in a comparable format at LUT and complemented by PoliMi representatives. In the second meeting, the documented observations were verified and discussed in more detail. The benchlearning report for the FINEEC audit was drafted based on the meetings and jointly made documentation on MSc thesis processes. The report was approved by people contributing to the benchlearning process at PoliMI and LUT.

Assessment of the process

Due to the pandemic, the people responsible for partnership between the two institutions could not travel to meet, get acquainted in person or discuss wider cooperation potential. Covering multiple degree education themes was not a realistic goal. However, the benchlearning project succeeded in defining a topic that provides real added value to the double degree programme delivery and in designing a benchlearning process that could be implemented in a restricted time. This was based on good cooperation between representatives of PoliMi and LUT stemming from the degree programme specific negotiations during the autumn semester. Seven degree programme representatives from PoliMi and six from LUT contributed to the process facilitated by LUT's director of international and study affairs.

MSc thesis practices

The MSc thesis focuses on developing the same scientific research competence in both institutions: retrieving information, using research methodology and scientific reasoning, providing new knowledge, reporting and presenting the research process and results. The differences of the procedures are briefly described below.

- The student **workload** of an MSc thesis at PoliMi varies between 15 and 20 ECTS credits depending on the degree programme, while at LUT, the workload is always 30 ECTS credits.
- LUT assigns two **supervisors** for each thesis while PoliMi usually one supervisor. In both institutions, the (primary) supervisor needs to be a professor/docent in the field of science in question, and at LUT, the secondary supervisor must have at least an MSc degree. At PoliMi, co-supervisors are assigned e.g. if the thesis is completed in a partner institution.
- At PoliMi, students are typically quite closely **supervised** and steered in the thesis work, while students at LUT are expected to finish the thesis more independently. There are no binding rules on the supervision procedures at either institution.
- The majority of LUT's theses are typically executed in **cooperation with industry** or other external commissioners. In these cases, the secondary supervisor can come from the commissioning organisation. At PoliMi, a minority of theses are executed in cooperation with industry or other companies. The empirical part of the thesis is typically carried out in a relevant research laboratory at PoliMi.
- At PoliMi, all MSc theses are **presented** and defended orally in front of a jury of four professors. In the defence, students face the challenge of presenting their work in front of an audience. The defence is a part of the thesis protocol and celebration. At LUT, in some degree programmes the thesis is presented in a seminar to supervisors and student peers.
- In both institutions, the theses are **assessed** according to predefined criteria and grading schemes. At PoliMi, the supervisor and opponent of a thesis provide a written evaluation report for the jury. At LUT, the supervisors prepare a written statement and suggest a grade for the thesis. At PoliMi, theses are approved by the supervisor, while at LUT the dean of a school approves theses and their grades.

- In both institutions, MSc theses are **published** in a publication repository. If necessary, a thesis can be classified as confidential for two years at LUT and for an unlimited time at PoliMi.

Good practices of LUT	**Good practices of PoliMi**
Active industry cooperation	Intensive supervision culture
Digital plagiarism checker verifies originality of thesis	Oral defence of thesis
	Grading scale describing the scientific level of the thesis

Applying the benchlearning observations

The information received in the benchlearning process has been/will be utilised in designing the double degree structures and informing students about the double degree programmes and the practices of the partner university. In the long run, the benchlearning process can contribute to MSc thesis development at LUT.

Audit team's feedback

With its benchlearning task, LUT addresses the cooperative development of future double degree programmes with international partners in a systematic manner. The project complies with the strategy of the university to achieve internationalisation, especially through the introduction of double degree programmes. The particular attention to the master thesis in this process shows foresight and sensibility for different educational systems, the latter being an essential prerequisite for successful international cooperation. The audit team particularly highlights this approach, as it lifts the university’s internationalisation activities to a level that goes beyond mere student mobility.

Appendix 1. Evaluation criteria for the level good

- Auditointiryhmän arvio

1 Evaluation area I: HEI creates competence

1.1 The planning of education

The degree programmes and other provision are planned with clearly defined learning outcomes. The planning process ensures that the educational provision is in line with the HEI's strategy and relevant for working life. Aspects concerning internationalisation and continuous learning needs are ensured in the planning process. In terms of degrees, it is ensured that they correspond with the National Framework for Qualifications and Other Competence Modules. The education is planned so that the teaching methods, assessment of learning, and learning environments support the achievement of the learning outcomes. Students and external stakeholders participate in the planning of education in a purposeful manner. Research, development, innovation and artistic activities are integrated in the education in a way that links research-based information to the education in a relevant way. The students' workload is defined according to the principles of the ECTS (European Credit Transfer and Accumulation System). The HEI has systematic procedures for approving the plans for degree programmes or other study entities.

1.2 The implementation of education

The HEI applies the provisions and regulations concerning student admission, the recognition of prior learning, progress of studies and completion of degrees consistently and transparently. The education is implemented in a manner that supports target-oriented learning and the active role of students in their own learning process. Students receive feedback on their learning which helps them achieve the learning outcomes. The procedures connected with the implementation of education support the efficient progress and completion of studies as well as the integration of students with professional life. The well-being and equality of students are promoted throughout the student's study path. The HEI provides adequate resources, counselling and other services to support the progress of studies and learning.

1.3 The evaluation and enhancement of education

The HEI systematically collects and uses feedback data on the needs of students, the implementation of the education and the progress of studies in order to enhance the education. Feedback-on-feedback, i.e., information on changes introduced based on student feedback is provided to students in an appropriate manner. The HEI monitors and evaluates the degree programmes and other provision to ensure that they are up to date with regard to the latest

research findings as well as the changing needs of the society and working life. Opportunities for continuous learning are ensured in the educational provision. In the degree programmes and other provision, how well the intended learning outcomes are achieved is analysed. Feedback and evaluation data is used systematically in the enhancement of education. The needs of staff and students are considered in the development of support services.

1.4 The HEI's examples of successful enhancement activities

The HEI is able to present examples of successful enhancement activities.

2 Evaluation area II: HEI promotes impact and renewal

2.1 Managing societal engagement and impact

The HEI enhances its societal engagement and impact, and this is also supported by its management system. The HEI has defined goals for its societal engagement and ways in which it attempts to reach those goals. Information produced by the HEI's analysis of its operational environment is used to set the direction for its activities. Appropriate procedures help to ensure that societal engagement supports the implementation of the HEI's overall strategy.

2.2 Research, development and innovation activities as well as artistic activities with impact

The HEI's research, development and innovation activities as well as artistic activities contribute to reforming society. Targets have been set for the impact of the HEI's research, development, innovation and artistic activities. The HEI collects relevant information regarding the societal impact of research, development, innovation and artistic activities, and the information is used in the enhancement of these activities. The HEI has systematic procedures for ensuring the responsible conduct of research. The HEI enhances open science.

2.3 Promoting renewal through the organisational culture

The organisational culture of the HEI encourages experimental activities with partners and strengthens the conditions for a creative atmosphere. The HEI seeks opportunities to engage with stakeholders in activities which enable renewal and enhancement. The HEI has functioning procedures that support the use of the competences possessed by its staff and students. The HEI has target-oriented cooperation with its alumni and it utilises the alumni in enhancement activities. Collaboration with both national and international networks supports the enhancement of the HEI's activities. The HEI has well-functioning procedures for managing and updating its stakeholder relations and collaboration networks.

2.4 The HEI’s examples of successful enhancement activities

The HEI is able to present examples of successful enhancement activities.

3 Evaluation area III: HEI enhances quality and well-being

3.1 Using the quality system in strategic management

The principles, objectives and responsibilities of the quality system constitute the HEI’s quality policy, which is public. The quality policy forms a common basis for the quality work. The information generated by the quality system is used in the management of the HEI. The system supports the profile of the HEI, the achievement of its objectives related to the core duties and the implementation of its strategy. The HEI ensures that the staff recognise the connection between their own work and the goals of the HEI.

3.2 Supporting the competence development and well-being of the staff

The HEI has functioning procedures to identify development needs concerning staff competence and to support the development of staff competence. The HEI has transparent procedures for staff recruitment. The HEI has systematic procedures to support the well-being, equality and non-discrimination of staff.

3.3 Functionality and development of the quality system

The HEI has a functioning quality system which covers its core duties. The quality system helps the HEI to recognise development needs and to enhance its activities in a goal-oriented manner. There is evidence of the functionality and impact of the quality system on the enhancement of the core duties. The system is developed in a systematic manner.

The quality culture of the HEI is participatory and open. Staff, students and external stakeholders participate in the enhancement of the HEI’s activities in a purposeful manner.

3.4 The HEI’s examples of successful enhancement activities

The HEI is able to present examples of successful enhancement activities.