



How to build capacity for entrepreneurship and innovation

Linköping University, Sweden

Abstract

Linköping University (LiU), a young higher education institution in southern Sweden, has systematically built capacity for entrepreneurship and innovation. The University's organisation as such is deliberately interdisciplinary in order to foster innovation: twelve Departments offer research and education to all of the University's four Faculties. Two entities are dedicated to support entrepreneurial students and staff: the Project, Innovations and Entrepreneurship (PIE) division and LiU Innovation. PIE focuses on research and teaching, while LiU Innovation supports researchers, arranges contacts to trade and industry and other actors in the regional innovation system. Furthermore, a joint organisation named Student Innovation by LiU supports entrepreneurial students. Several remarkable spin-offs have emerged from LiU, and the combined turnover of spin-offs has increased steadily and strongly since 2005. LiU provides a good example of the role that a university can play in regional economic development. Entrepreneurial education, innovation and incubation at LiU contributed decisively to flourishing trade and industry in the Östergötland region.



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Year: 2024

HEInnovate dimensions:



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Overview of Linköping University

Linköping University (LiU) is a relatively young higher education institution, founded in 1969 and granted full university status in 1975, with a high-quality profile. In 2023, it was on rank 39 in the global Young University Rankings.¹ Today, it has 40,400 students, making it one of Sweden's largest academic entities.² Linköping is a city in Southern Sweden, 200 kilometres south-west of Stockholm, with approximately 165,000 inhabitants. Linköping University has four faculties: Arts and Sciences, Medicine and Health Sciences, Science and Engineering as well as Educational Sciences. LiU is a campus university, spread over four campuses. Campus Valla and campus US (university hospital) are situated in Linköping; plus campuses in the nearby towns Norrköping and Lidingö, the latter focused on furniture and design. LiU is different from other universities in that it has multidisciplinary departments, twelve altogether, to facilitate collaboration across boundaries. Most prominent is the Department of Thematic Studies (TEMA) that focuses on children, technology and society, and gender.³ A department can conduct education and research for several faculties. LiU's strategy comprises six themes: Open and inclusive, Learning and knowledge creation, The students shape the future, Excellence and impact, Sustainable societal transformation, Collaboration across boundaries.

Innovation and entrepreneurship play a key role at LiU; the University has established several dedicated institutions to strengthen its related capacity. Most important are the Project, Innovations and Entrepreneurship (PIE) Division and a unit named LiU Innovation. PIE belongs to the Institution of Management and Engineering (IEI); LiU Innovation to the Strategic Collaboration office, which in turn is part of the International Affairs and Collaboration Division. Both institutions, PIE and LiU Innovation, have dedicated objectives and tasks: PIE "conducts research, undergraduate education and commissioned activities in project management, innovation and entrepreneurship".⁴ LiU Innovation "supports students, researchers and staff at Linköping University to develop ideas from early concept to finished product or service".⁵ Units related to LiU Innovation include the LiU Holding in charge of collaboration for innovation, LiU Invest and a business incubator named LEAD.

This case study focuses on how Linköping University develops its **organisational capacity** for innovation and entrepreneurship in research, teaching and knowledge transfer through PIE and LiU Innovation.

LiU's aims in innovation and entrepreneurship

LiU's strategy rests on six paths: Open and inclusive, Learning and knowledge creation, The students shape the future, Excellence and impact, Sustainable societal transformation,

¹ See <https://www.timeshighereducation.com/world-university-rankings/2023/young-university-rankings?page=1#>.

² See <https://liu.se/en/article/liu-in-figures>.

³ See <https://liu.se/en/organisation/liu/tema>.

⁴ Quoted from <https://liu.se/en/organisation/liu/iei/pie>.

⁵ Quoted from <https://liu.se/en/organisation/liu/uf/isa/liu-innovation>.

Collaboration across boundaries. In order to make these paths real, LiU uses six “enablers”: people (“motivated and engaged students and co-workers at all levels”), campuses (with “flexibility in terms of study pace, physical presence and teaching methods”), digitalisation (being at the forefront of research for the digital transition), infrastructure (“including everything from databases to laboratories”), funding (being “reliant on external funding”) and organisation (highlighting “creative environments”).⁶ While these paths and enablers do not explicitly mention entrepreneurship and innovation, these themes are inherently included. PIE and LiU Innovation support the strategy.

PIE’s vision is “to create and disseminate research results of international standing and to attract and develop co-workers and students in our field of study”⁷.

Complementary, LiU Innovation is a service unit, not providing research and education but supporting knowledge transfer.

Resources for building innovation and entrepreneurship at LiU

PIE and LiU Innovation are strong entities with a considerable number of employees. The PIE website lists eleven employees, LiU Innovation seven. LiU Innovation has two offices at the main campus Valla.

PIE is financed through basic funds from LiU, through the funds for teaching and through external research projects that its researchers apply for. PIE is long rooted at LiU. First, this division was named “Industrial Organisation” and sorted under the economic department. After the millennium shift, the economic department and some other departments were merged into the bigger department IEI (Department for Management and Engineering), and the division’s name changed from “Industrial organisation” to “Projects, Innovations and Entrepreneurship” (PIE). The reason was to fit the name better to the areas of research.

The Strategic Collaborations Office and LiU Innovation are financed by LiU basic funds, through external funding such as EU projects, and funds from the Swedish government.

Project, Innovations and Entrepreneurship Division

Subject areas and target areas

PIE has four main subject areas:⁸

- **Industrial project management** involves the planning and management of technology and innovation activities.

⁶ See <https://liu.se/en/about-liu/vision-and-strategy>.

⁷ Quoted from <https://liu.se/en/organisation/liu/iei/pie>.

⁸ See <https://liu.se/en/organisation/liu/iei/pie>.

- **Innovation** examines industrial development and renewal, innovation systems and inter-organisational collaboration, technology and innovation strategies and innovation management.
- **Entrepreneurship, business and regional development** focuses on entrepreneurial and intrapreneurial processes in start-up teams, new and established businesses, entrepreneurial ecosystems and collaboration for regional development.
- **Pedagogical development and methods of learning** involves the study of experience-based, entrepreneurial and challenge-driven learning.

Industrial organisation and leadership are recurring themes in both teaching and research in all areas.

Moreover, PIE has three target areas, which are horizontal, irrespective of research focus:⁹

- **Learning and knowledge creation:** PIE's teaching addresses societal challenges and stimulates creativity and reflection in students through innovative teaching.
- **Collaboration across boundaries:** PIE develops interdisciplinary and cross-boundary cooperation in business, the public sector and civil society. Research projects leverage synergies between research, undergraduate education and collaboration.
- **Sustainable societal transformation:** By combining inter- and multidisciplinary perspectives in research and education, PIE generates new knowledge and innovation. Social transformation and sustainability are important, and PEI sees digitalisation as an important tool.

Education

For **undergraduates**, PIE teaching covers industrial organisation, leadership, innovation management, project management, entrepreneurship and idea development. Courses are student-centred. The teacher's task is to create an inspiring study environment. Learning processes combine personal development with research-based analyses and studies of and at companies. PEI's pedagogy is based on active learning, using own and others' case studies in courses. The pedagogical approach requires that students take responsibility for their own learning and that of others by considering themselves as co-creators of knowledge. Degree projects often cooperate with industrial companies and public organisations. Students who have or want to start an own business can do a so-called entrepreneurial degree project.

One of the most remarkable PIE courses is **InGenious** – cross disciplinary project. It is unique, as PIE provides it in collaboration with Almi East Sweden AB, a subsidiary of a state-own company that provides risk capital and consulting services (<https://www.almi.se/>). This company is also responsible for the innovation and entrepreneurship counselling to students and given under the trademark "Student Innovation by LiU". The course connects students with companies and public sector entities in the region. In this course, students from various faculties collaborate with each other in interdisciplinary project groups. They

⁹ See <https://liu.se/en/organisation/liu/iei/pie>.

tackle challenges from trade and industry and the public sector in the region. At the end of the course, the students pitch their solutions to challenge providers and other stakeholders. The InGenious course is also given at the Universities of Twente and Stavanger and is among the courses offered by the European university alliance ECIU. Besides the InGenious course, the course Innovative Entrepreneurship, available in the engineering Master's programme, also works on external ideas. During spring 2024, in these two courses approximately 80 students worked in groups developing business models for 18 research-based ideas from LiU researchers. Liu finds that this is a good way for students to try on the clothes of the entrepreneur and achieve both knowledge and skills related to innovation processes and the spin-out of new ventures. LiU developed this way of working over the years.

The **LiU Summer Academy** is a four-week credit-bearing programme for students from LiU and from partner universities.¹⁰ Meant to be a "transformative one-month journey", it offers courses with a "rich and diverse learning experience" that foster "cultural awareness". In 2024, the course subjects included: alternative energy, quality improvement in healthcare, leadership and organisational behaviour, nanotechnology, reading and learning in the world of comics, Sweden's language, culture and society as well as "the use (and abuse) of culture" and interprofessional collaboration in healthcare.

Finally, PIE offers the following **PhD courses**: Entrepreneurship in theory and practice; Sustainable change, business and strategy; Innovation management; Innovation and entrepreneurship classics; Embrace your doctoral and post-doctoral studies; Qualitative research methods in theory and practice.

Research

PIE conducts research in industrial organisation and change as well as management and organisational issues. Research focuses on different levels, from system and industry level to company and individual level. Research is interdisciplinarity and involves cross-boundary cooperation with national and international actors. Sustainable industrial development is an important aspect. Research and teaching focus on the areas of (1) industrial project management, (2) innovation, (3) entrepreneurship, business and regional development, and (4) pedagogical development and methods for learning.

Area 2, Innovation, examines industrial development and renewal, innovation systems and inter-organisational collaboration, technology and innovation strategies and innovation management in both large and small companies and organisations.

Area 3, Entrepreneurship, business and regional development, focuses on entrepreneurial and intrapreneurial processes in start-up teams, new and established businesses, entrepreneurial ecosystems and collaboration for regional development.

Area 4, Pedagogical development and methods of learning, involves the study of experience-based, entrepreneurial and challenge-driven learning in different contexts.

¹⁰ See <https://liu.se/en/education/liu-summer-academy>.

Industrial organisation and leadership are recurring themes in both teaching and research in all of these areas.

Entrepreneurship is also present at other departments. Major examples include the departments of Business Administration, Industrial Management, Environmental Technology and Management, and Industrial Management.

Collaboration

PIE supports decision-making in industry, government agencies and other organisations such as incubators and industry associations. PIE collaborates with partners outside academia both in research projects and contract education. Moreover, PIE diffuses research results through workshops, seminars and publications in scientific and popular media. PIE has a long history of managing contract education. A forerunner in contract education was the Centre of Innovation and Entrepreneurship (CIE) launched in the 1990s. CIE gave an entrepreneurship programme for new ventures, a kind of incubator programme at several sites across Sweden. CIE also ran a growth programme for SMEs. CIE as such was winded up around 2005, shortly after its founder Magnus Klofsten became professor in entrepreneurship at PIE. The entrepreneurship programme still lives in PIE's entrepreneurship courses, currently focusing on rural entrepreneurship with finance from the Kamprad Foundation. The local business network SMIL that is dedicated to business development and entrepreneurship in Linköping also has its roots in CIE.

The Strategic Collaborations office and LiU Innovation

LiU Innovation is the part of the Strategic Collaboration office that supports students, researchers and staff at Linköping University to develop ideas from early concept to finished product or service. The innovation advisors counsel in areas such as start-up and financing. The service is free of charge for students, researchers and LiU staff. The innovation and entrepreneurship support directed to students is run under the trademark "Student Innovation By LiU", in collaboration with the company Almi East Sweden AB.

The Strategic Collaboration office sorts under the International Affairs and Collaborations Division (ISA) that in turn is part of the University Services. The ISA organisation is three-legged and includes (1) the Commissioned Education office, (2) the International Office, and (3) the Strategic Collaboration Office. The Strategic Collaboration Office itself is three-legged. Besides LiU Innovation it includes a group working with donations to the University and a group that focuses on collaboration with the surrounding regional and national innovation systems of both business, support actors and public bodies – as described in the following:

LiU Holding AB

LiU Holding is a limited company that is 100% owned by Linköping University, founded in 1990. The relationship between LiU and LiU Holding has a long history. Over the years it developed into an important actor in utilising knowledge generated at LiU. LiU Holding supports

innovation and collaboration, from ideas and investment support for students, researchers and employees to collaboration with society. The Holding has a number of affiliated companies, namely:

- **LiU Invest**, an investment company, which invests in early-stage research-related companies from LiU, commercialising research findings.¹¹ Investments range from a few hundred thousand up to a several million Swedish crowns.
- **LEAD**, the business incubator which grows new ventures into fledging firms. Its mission is to help companies with good ideas to grow. It works closely with the Strategic collaborations office and its unit LiU innovation as well as with Mjärdevi and Norrköping Science Park.
- **Uni talent** offers companies and organisations in the region the opportunity to get to know potential employees through temporary student consultancy assignments.
- **Spetsa** aims to transform research findings into practical use and to increase collaboration between Linköping University and society. Spetsa is a consulting company based on the knowledge and experience of the employees at Linköping University.

Drivers and barriers to develop entrepreneurship and innovation

The University's roots are in the 1960s, when the Swedish Parliament decided to establish a branch of Stockholm University, together with a university college of engineering and medicine, in Linköping. A main driver behind establishing LiU was the SAAB company, that needed both skilled labour and technology. Right from the beginning, interdisciplinarity has been the focus and LiU has claimed to be an entrepreneurial university. Strong relations were formed right away with a technology centre that is today named Linköping Science Park. Incepted in 1984, it was the first science park in Sweden along with another park in Lund.

Charlotte Norrman, Senior Associate Professor, Department for Management and Engineering, believes that the barriers to developing entrepreneurship and innovation at Linköping University have been “more or less the same as everywhere”. However, a tight community in the regional innovation system might be unique at LiU. Predominantly, this community has enabled the region to build strengths. The region's strong industrial network, the university hospital and the science park have been particularly strong players contributed the region attractive.

Impact

The main entrepreneurial output from LiU is the fact that Östergötland today is a strong region with flourishing trade and industry – economic strength built upon entrepreneurial spirit that is also prevalent at LiU and upon tight collaboration within the regional innovation system. It is a good example of a symbiosis between the quadruple helix actors in science,

¹¹ See <https://www.liuinvest.se/en/>.

business, government and civil society that together formed the regional innovation system.

A dedicated website lists several dozen new businesses that emerged from LiU.¹² The most prominent examples include Sectra, a medical IT company founded in 1978; IFS, a developer of business software founded in 1983; and Teledyne SP Devices that develops signal processing technology, founded in 2004.

In 2022, LiU counted 67 active spin-off companies from LiU which had altogether 1,215 employees and a turnover of 2.1 billion Swedish Crowns (SEK). Three companies accounted for more than half of turnover: Neo4j (715 mio. SEK), Voyado (366 mio. SEK), and BRP systems (117 mio. SEK). Further 31 companies were in the incubation phase, and 37 in pre-incubation, that is potentially forthcoming spin-offs. Since 2006, when the total turnover of spin-offs amounted to 40,3 million SEK, the turnover has increased steadily and was more than 50 times higher in 2022.

From 2005 to 2022, LEAD evaluated 1,061 ideas with potential business value, thereof 42 % from academia (mostly from LiU), 32 % from industry, 23 % from individual entrepreneurs, and 4 % from other sources. Data for 2023 show that more than a third (38 %) of business ideas evaluated were in ICT and software, 25 % in life sciences, 15 % in environment and energy and the remainder in other fields.

Sources and Contacts

Sources

- University of Linköping start page: <https://liu.se/en>
- LiU Project, Innovations and Entrepreneurship (PIE): <https://liu.se/en/organisation/liu/iei/pie>
- LiU Innovation: <https://liu.se/en/organisation/liu/uf/isa/liu-innovation>
- LEAD business incubator: <https://liu.se/en/organisation/liu/lhg/lead>

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¹² See <https://liu.se/en/article/successful-companies>.