LAPPEENRANTA UNIVERSITY OF TECHNOLOGY

SOLVER

THOSE WITH COURAGE THINK DIFFERENTLY

- Rector Anneli Pauli

LUT
Lappeenranta
University of Technology

THE BRAVE LEAP FURTHER

STUDENT SATISFACTION
The best student satisfaction among scientific universities according to a survey carried out among Bachelor's degree students in Finnish universities. (Bachelor's survey, autumn 2013)

INTERNATIONALLY AWARDED RESEARCH AND TEACHING ENVIRONMENT GREEN CAMPUS which embodies LUT's energy expertise and sustainable ideology.

10

SCORED A 10 IN TALOUSELÄMÄ MAGAZINE'S UNIVERSITY RANKING LIST for business cooperation in the IT sector.

50–60

INVENTION NOTIFICATIONS EACH YEAR

3–5

RESEARCH-ORIENTED COMPANIES ARE LAUNCHED DURING THAT TIME

100%

RECOMMENDED BY 100 PERCENT
200 influential Finns were interviewed as part of LUT's 2012-2013 image survey.

THE OVERALL IMPRESSION IS VERY POSITIVE: 66% of respondents have either a very positive impression or to some extent positive impression of LUT. All respondents who have collaborated with LUT recommend it.

3.8

THE OVERALL IMPRESSION OF LUT IS VERY POSITIVE: Scored an average of 3.8 on a scale of 1 to 5.

THE RESPONDENTS REGARD LUT AS

COOPERATIVE

OPEN-MINDED

COURAGEOUS

PASSIONATE INNOVATOR

DEVELOPER OF WELLBEING

INTERNATIONALIZATION
International staff mobility has grown by over 70% from 2010 to 2013

70%

APPLICANT NUMBERS The number of primary applicants in joint selection has grown by 48% from 2010 to 2014

48%

AMOUNT OF RESEARCH The number of refereed international publications has grown by over 50% from 2010 to 2013

50%

SUPPLEMENTARY FUNDING
Supplementary funding has grown by about 15% from 2010 to 2013

15%

> Mission: We are developing Finnish wellbeing with our scientific, technological, and economic expertise - creating a sustainable and competitive advantage.

PHOTOS Samuli Karala

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From our rector

PHOTO Teemu Leinonen

SOLUTIONS AND SOLVERS

> Those with courage think differently.

In addition to achieving high quality in education and research, LUT aims to make a real societal impact. We want to educate future problem solvers and produce solutions. The kind of graduates who will lead to advances in the ways in which we tackle environmental problems and the challenges of working life.

LUT is the ideal size for a university. With our focused and relevant expertise, as well as our agile team spirit, we at LUT are working together to build an economically, ecologically, and socially sustainable world.

As an international and innovative university, focused on technological and economic matters, we, alongside our partners, are pioneers in the creation of green energy solutions and the technological prerequisites for sustainable competitiveness.

Those with courage think differently.

ANNELI PAULI
Rector

PHOTO Mikko Nikkinen

The best in LUT are its people: here you will find wise and motivated people. For example, in the students' entrepreneurship society the fellows there really concentrate on their own thing.

Contacts with Russia was one big reason why I searched my way to LUT. A year in Moscow as an exchange student was a valuable experience. In fact, in future I want to do business that is related to Russia.

MARKUS LAUKKANEN
Chairman of LUT Entrepreneurship Society (LUTES)
Student of economics and business administration

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441 209
Printed matter

THE MOST AGILE WILL CLAIM THE PRIZE

PHOTO Samuli Karala, Johanna Kannasmaa

We are shifting from the world of corporations to the era of agile organizations. Being alert is the key to success in this ever-changing world.

Large, hierarchical organizations suffer from sluggishness. When the changes are rapid, decision making can be slow. We must be simultaneously strategic and agile.

For their part, smaller organizations do not become bloated; instead, they actively seek out external business partners from among the best in the world. There is no need to be big in order to think big - to leave behind an innovative footprint larger than one's own.

LUT's successes are based on its culture of focus, determination, and agile collaboration. Its compact size enables it to respond quickly and fearlessly in its actions. This combination is one the greatest assets in tackling future transformations: new success stories emerge from ingenuity, sustainability, and from breaking down barriers.

LAURA LARES
Entrepreneur and Managing Director, Woimistamo Oy
LUT alumna
Vice-Chairperson of the LUT Board

PHOTO Olli Rehnin arkisto

LUT is a pioneer and future maker - combining technology and economics. LUT's expertise is transferred into the business world and society in general, generating new businesses and an open-minded approach.

LUT promotes green entrepreneurship, which will have a crucial role to play in the development of Europe and the whole world.

OLLI REHN
European Commissioner for Economic and Monetary Affairs and the Euro

BRINGING OUR TRIPLE DEBT UNDER CONTROL

PHOTO iStockphoto **TEXT** Laura Tikkanen

Our future needs people who understand the big picture: we need builders of new worlds and we need productivity innovations.

Humankind's financial, economic, and social indebtedness - in others our triple debt - must be brought under control by means of responsible action.

We use our natural resources 1.5 times beyond our means. We live on credit and and, in doing so, take food off our children's plates. People are starting to feel the strain under increasing pressure.

LUT is creating the conditions for a sustainable society by finding solutions to challenges related to the environment and energy, by creating sustainable competitiveness through the research of entrepreneurship and innovation ability and by promoting well-being through the development of work life processes, productivity and management.

"Companies must develop technologies, business models and approaches with which they can succeed in international competition and, at the same time, are able to behave in an ethical and ecologically responsible way", **Kaisu Puumalainen**, Professor in Technology Research, says.

CROSS-POLLINATION OVER THE BORDERS

Productivity innovations, primarily, will be the solution for the triple debt. Usually, they do not emerge within a single scientific discipline or in a traditional manner.

"Our future needs people who understand the big picture, and it needs builders of new worlds", **Vesa Harmaakorpi**, Professor in Innovation Systems, states.

Harmaakorpi with his team has worked out some

> Our future needs people who understand the big picture: we need builders of new worlds and we need productivity innovations.

unconventional methods which make use of intellectual cross-pollination. These include methods of art and culture in the development of organizations.

LUT has several research efforts in economics and business under way to attempt to increase the cost efficiency and responsibility in public procurement in our country.

SOCIAL ENTREPRENEURSHIP ON THE AGENDA

Social enterprises, which have become global, solve social or environmental problems, thus creating social or ecological value while seeking profits. They can, to some extent, complement the public sector as producers of services.

"Social entrepreneurship is not well known in Finland, but, on the EU's agenda, it has been there for a long while already", Puumalainen explains.

LUT's energy research covers the whole production chain from energy sources to markets. Cleantech, signifying clean technology, creates ecological and economic value. In LUT, its development has been researched cooperatively between the disciplines of industrial management and environmental technology, among others.

According to research, Finland's cleantech industry would need clear criteria, speed to marketing and overhaul of public funding. That would guarantee a proper launch for the field.

NEW EXPERTISE ON GREEN ECONOMY

Also LUT's education is accompanied with sustainable development. The university's degree programmes include the standpoints of sustainable develop and green economy.

"In future, making use of big data will be more and more essential. Big data means collection of huge masses of data and their analysis by information technology. By mastering it, companies can create new value and cost efficiency to help getting the triple debt under control", says Puumalainen. ■

SOLAR ECONOMY IS THE LIFE SOURCE FOR THE FUTURE

There is no lack of energy on the earth, only its recovery creates challenges. In the future, estimates the first Nordic Professor of Solar Economy, two-thirds of our daily energy requirements will be directly derived from renewable energy sources.

PHOTOS Mikko Nikkinen, Teemu Leinonen **TEXT** Satu Tähkä

"Only energy from the sun can ensure the survival of our civilization", **Christian Breyer**, the first Nordic Professor of Solar Economy, states.

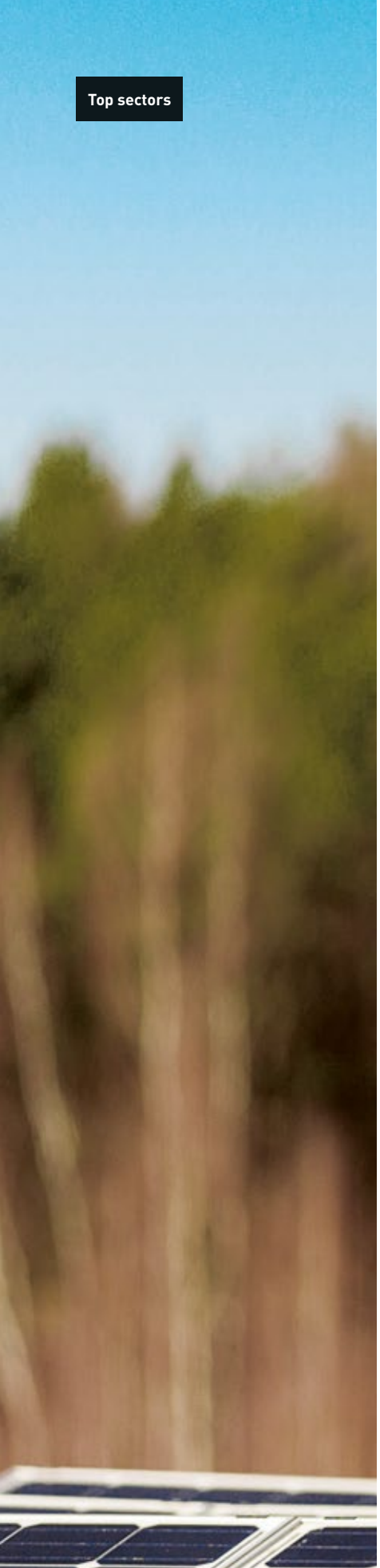
Solar economy is not limited to solar power; it includes all energy forms, e.g., wind power, water power and bioenergy, originating from the sun. Thus, there is no lack of energy on the earth, after all – only its recovery still creates challenges.

"Sun and wind form the solution for these energy challenges. These together produce more energy than we will ever need. The sustainability of our present energy system is inadequate: we have to find other solutions and adapt to the changes. Completely renewable energy will come", Breyer says.

According to Breyer, the technology required to produce energy from renewable sources already exists, and the keys for the solution of the energy crisis already are in our hands. However, there is still a lot of room for development in the utilization of technology.

"Use of renewable energy must increase, our awareness of the topic must improve and the costs must be brought down. The more we use renewable energy technologies, the more we will learn and the bigger the share of these energy forms. That, in turn, will decrease the costs. In practice, we must increase people's awareness of the possibilities in the utilization of solar-based energy."

> Solar economy is not about solar power alone.



> Extra energy is fed through the network to other users.

FROM CONSUMER TO CONSUMER-PRODUCER

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PROBLEMS CAN BE SOLVED

Before a single invention can be brought to the markets, investments on research and demonstration must be made. LUT is piloting a smart electricity grid, in which energy is produced, consumed and stored. The smart electricity grid has proved functional, but there are still many unresolved issues in the system.

"We are aiming towards a deep system-level understanding about the transfer to a carbon-free energy system and about the factors affecting economy, environment, technology and competitiveness in this respect. This power-to-gas model is exactly what we can use to prove that the energy model of distributed production will work. In due course, we intend to generalize the model to a global one to describe local, distributed energy production also in other parts of the world." ■

PHOTO Fortum Oyj

Together with LUT, we are building a future without carbon dioxide emissions. Our common goal is a novel energy system based mainly on renewable energy.

I like LUT`s visionary thinking and, the way they perceive the future energy system and markets as a comprehensive whole.

Graduate engineers and economists from LUT are currently involved with finding the solutions to globally-important problems such as those related to sustainable competitiveness and the environment.

TAPIO KUULA
President and CEO of Fortum Oyj
Dr (h.c.), LUT

KEEPING AFLOAT

LUT's laboratories are the largest concentration of water research in Finland. In the future, clean water will be our most valuable natural resource.

PHOTO iStockphoto **TEXT** Anna-Liisa Pirhonen

> It is probable that we will learn it the hard way. This doesn't, however, mean that the solutions shouldn't be attempted.

"Availability of clean water is the question of survival for the humankind", says **Mika Sillanpää**, Professor in Green Chemistry and the Head of LUT Chemtech. Led by Sillanpää, LUT is developing advanced water treatment processes. LUT's laboratories form Finland's largest concentration of water research.

"We are looking for breakthroughs for the world's water challenges", Sillanpää tells.

The methods are used for the treatment of raw water, waste water and various process streams. LUT's research is aimed at reducing water consumption, producing clean drinking water and purifying waste water to avoid polluting water bodies. For example, the electric discharge method and LED radiation are good and promising methods, as are the photocatalytic methods, oxidation processes, membrane technology and nanotechnology.

CLIMATE CHANGE CONTAMINATES WATER

Mika Sillanpää is worried about the impact of climate change on the world's water bodies. He has investigated the impact of climate change for example on water resources originating from the Tibetan Highlands and has visited the area 12 times.

"The Highlands of Tibet are sometimes called the world's third pole, the rivers of which carry water to about two billion people. In addition, economic growth is very fast downstream. This makes the research in this region so important."

MULTIDISCIPLINARY APPROACH

Industry uses about one quarter of the world's fresh water. In Finland, the use of water by the process industry has, in many sectors, radically declined for the past decades. For example, water consumption per tonne of product by the paper industry has diminished to a fraction of the 1960 level. According to Sillanpää, the paper industry's water use is a good example, which can be copied as a model of water use also for countries in the process of industrialization.

"LUT's multidisciplinary approach offers excellent solution methods for industrializing countries. It has to be remembered also that agriculture consumes the most part of fresh water. This portion will increase due to population growth and consumption habits."

MORE VALUABLE THAN OIL

In the Near East, a litre of water is already five times more expensive than a litre of oil. For the requirements of life, the world's freshwater reserves are much more relevant than oil. If the value of water and its fair distribution is understood in time, also the world's political development will remain more stable.

"It is probable that we will learn it the hard way. This doesn't, however, mean that the solutions shouldn't be attempted." ■

PHOTO iStockphoto **TEXT** Päivi Piispa

RUSSIAN ECONOMY FACING A SLUMP

The growth of Russia's economy has nearly ground to a halt. The reasons for this go beyond foreign policy crises or economic sanctions.

For the past decade, Russia's economy still grew at top speed. The economy, among the world's largest, grew at the rate of nearly seven percent annually.

Now the situation has changed, and it doesn't come as a surprise. Already in 2012, the growth was just over three percent; last year it just about exceeded one percent. The forecast for the first half of 2014 shows even more deterioration.

"Russia's production growth has practically come to an end", **Pekka Sutela**, Professor of Practice at LUT, states.

SIGHTS SET BEYOND UKRAINE

The reasons for Russia's economic situation go beyond the effects of the crisis in Ukraine or economic sanctions that the EU and the USA have placed on Russia. Most of the rapid growth in consumption for the past decade was directed towards foreign products. This is typical when the purchasing power increases and the currency is undervalued. For example, consumer demand for cars has been strong, and among commodities up to 40 % of foods have been imported. Russia's exports have not grown in parallel, and the production growth has stopped.

"Now, when the rouble no longer is undervalued, the growth in private consumption has slowed down, and the rouble has weakened by 20 percent. Consumption no longer remains the locomotive of the economy – investments are needed", Sutela tells.

Private investment, however, has not increased at the speed desired.

"There is no investment boom or even a sign of it. This is a serious matter for the long-term development opportunities in Russia's economy."

FURTHER DOWNTURN IN PUBLIC INVESTMENTS?

The state of Russia makes investments, but even those are one-off rather than involving improvements in the infrastructure.

The investments in the Sochi Olympics serve as a good example. The amount of state investments depends on the price of oil, which has remained stable for the past few years. Export income from the state-owned energy companies is not increasing, which affects the development of the state expenditure.

> Consumption is no longer the locomotive behind Russia's economy.

"If the price of oil goes up, Russia's public sector expenditure cannot rise, either. For this reason, the public expenditure last year grew only by four percent – in practice, declining. That is one of the reasons for the low growth of Russian economy."
It remains to be seen whether the public sector expenditure will also in future remain linked to the price of oil.

"Putin and his companions have promised that military expenditure will be increased by 40 percent. If the total expenditure cannot be allowed to grow, there must be cuts somewhere. It is a difficult equation."

COMPANIES BELIEVE THAT SIZE EQUALS STRENGTH

Those looking for economic growth are turning their eyes towards the private sector. What might be the next Russian invention to reboot the country for new growth?

"No country can foretell from where the next innovation will emerge. Who for example could have guessed that Finland would become the country of mobile phones? – Nevertheless, it seems to have been a fairly transitory phase."

"Innovation and the culture of start-ups do not yet seem to be very deep in the Russian young business culture. A very strong element in traditional Russian thinking is the protection of existing jobs."

"Creative destruction and capitalism do not sit well with this ideology. Previously, the country has placed its confidence on the strength of its size and benefits of its scale. There are no subcontracting chains; traditionally, the factories owned by the state have done all by themselves. This market structure weakens small companies' opportunities to develop into medium-sized companies." ■

Solution-oriented

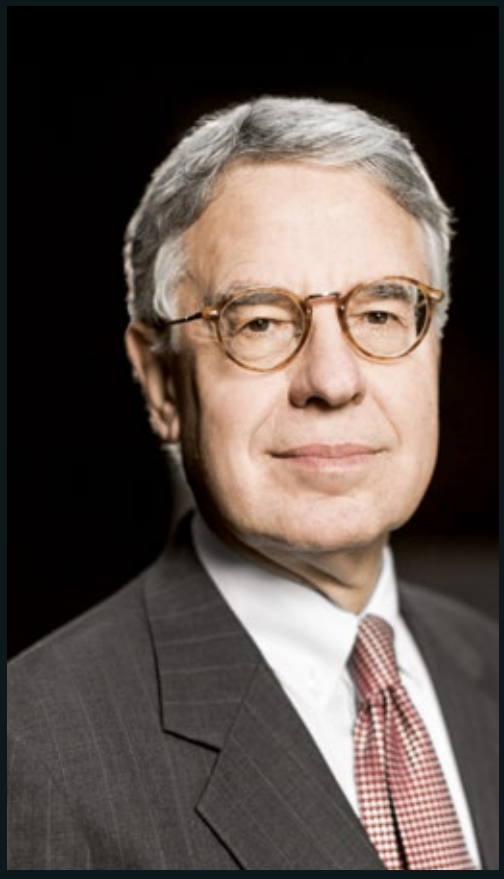

PHOTO Teemu Leinonen

Russia is one of LUT's strengths. The University has close connections with Russia and particularly with the universities in St. Petersburg, as well as a comprehensive network of partners right across Russia.

Specialising in relationships with Russia is a challenging aim; one not attempted by any other university in Finland. Moreover, this aim requires continued consolidation of the university's areas of expertise and the systematic broadening of student and researcher exchange programmes. I'm delighted that I am able to be involved in this important work.

RENÉ NYBERG
Ambassador
Member of the LUT Board

Solution-oriented

GROWTH COMPANIES FROM THE UNIVERSITY

Entrepreneurship, commercialization of research results and start-ups are a part of LUT's social influence.

ILLUSTRATION Aino Sipilä **TEXT** Heli Huhtanen

"For solving the problems of today and tomorrow, close cooperation between the world of university and business is needed", **Tuomo Rönkkö**, LUT's Chairman of the Board, emphasizes.

"In line with our strategy, we want to create new growth and business activity for Finland."

For the past years, LUT has promoted commercialization of research results, licensing and new business activities. LUT has open-mindedly assumed the third task for universities: the challenge of and opportunity for social interaction.

"We encourage the members of LUT's scientific community to promote innovation activities, apply for patents and facilitate the establishment of research-oriented companies", Rönkkö explains.

OWN INVESTMENT COMPANY PROVIDING THE FINANCE

Yearly, there are 50-60 innovation notifications made at LUT. After an evaluation process by experts, further development funding is sought for about ten of these through Tekes's Creating Business from Research programme, for example.

The university's own investment company, Lureco Oy, is already funding two companies making use of LUT's research results: Aurelia Turbines Oy, which manufactures a new type of gas turbine, and Endev Oy, which is developing an ecological treatment method for sewage sludge.

The invention notifications and commercialization projects demonstrate LUT's strong industrial and technological know-how, which emphasizes green energy and technology. The funding needs for these projects are greater when compared with, for example, the needs of service or ICT companies.

TECHNOLOGY AND BUSINESS MODELS COALESCING

Professor of Practice **Anssi Vanjoki** is one of the evaluators and supporters of innovations.

"My role is to give support and help in anchoring research into practice, testing research ideas, commercialising research knowledge and expertise, in entrepreneurship, and in looking for and launching start-ups", Vanjoki tells.

"Of special interest in LUT are technology-based top projects, in which deep technological expertise and business models are combined."

According to Vanjoki, expertise entrepreneurship, such as academic start-up companies, is a future trend.

"The importance of companies based on research and knowledge is constantly rising, competition with costs in international business becoming more and more difficult."

* WIRMA LAPPEENRANTA OY'S AND IMATRA REGION DEVELOPMENT COMPANY'S PROJECT

** FOR EXAMPLE, INTERNATIONAL ENTREPRENEURSHIP AT LUT SCHOOL OF BUSINESS. THE COURSE RECEIVED THE FINNISH ASSOCIATION OF BUSINESS SCHOOL GRADUATES (SEFE) AWARD.

Solution-oriented

OUR CURRENT UP-TO-DATE STRATEGY

PHOTO Teemu Leinonen

In our current economic situation, we need daring, courage and new energy. It is the spirit of innovation that reigns at LUT: green energy and technology, sustainable competitiveness and Russian expertise are important future success factors. LUT's participation is strong in these through research, education and practical business cooperation. We are contributing to the saving of the Finnish society and the world.

LIISA ROHWEDER
Secretary General of WWF Finland
Member of the LUT Board

LUT IN NUMBERS

PRIORITY AREAS

Green energy and technology

Sustainable value creation

Building an international hub of Russian relations

VISION 2015

LUT is an agile, international university combining technology and business.

In its key areas of expertise, LUT will represent the top European level.

MISSION

We will contribute to the welfare and sustainable value creation of Finland with our expertise in science, technology and business.

VALUES

Courage to succeed

Passion for innovation through science

Will to build well-being

615

MASTERS DEGREES

428 degrees awarded for Master of Science in Technology and 187 for Master of Science in Economics and Business Administration

380

BACHELOR'S DEGREE

253 degrees awarded for Bachelor of Science in Technology and 127 for Bachelor of Science in Economics and Business Administration

57

DOCTORATES
50 degrees awarded for Doctor in Science in Technology and 7 for Doctor of science in Economics and Business Administration

STAFF

960

DIFFERENT NATIONALITIES IN THE ACADEMIC COMMUNITY

67

889

SCIENTIFIC PUBLICATIONS

OPEN UNIVERSITY STUDENTS

1500

UNDERGRADUATE AND GRADUATE DEGREE STUDENTS

4800

CONTINUING EDUCATION STUDENTS

600

FUNDING IN 2013

MINISTRY OF EDUCATION AND CULTURE FUNDING

48,4 M€

SUPPLEMENTARY FUNDING

34,8 M€

The LUT team has joined me on many of my export promotion tours - they're a really driven group!

Concrete business cases and visible results. These are exactly what Finland needs to forge ahead!

ALEXANDER STUBB
Minister of European Affairs and Foreign Trade
Dr (h.c.), LUT