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Foreword

In this institutional plan Eindhoven University of Technology crystallizes its Strategic Plan 2020 for the period 2013 – 2016. For each element of this strategy projects have been started up, project leaders designated and targets set for the coming years. This institutional plan describes the concrete activities and intended results.
The world is confronted by major challenges in areas like energy, health and mobility. New technological concepts are needed to tackle these challenges. Industry, research institutes and government are converging their efforts through regional and thematic networks to enable these concepts to be realized. Embedded in international, national and regional networks of education, research and innovation, TU/e is making a significant contribution to solving these major societal challenges. By turning out high-quality engineers and, through its research and valorization, discovering and developing concepts that can be put to use. This institutional plan describes what TU/e will be doing over the next four years to this end and what it wants to achieve.

The institutional plan is part of the university’s planning and control cycle. The TU/e sets down its long-term vision in a strategic plan every eight years. This is translated into a continuous strategic program in which the key objectives and milestones are laid down in successive institutional plans (every four years), annual executive agendas and annual budgets. In annual reports TU/e gives an account of the policy that has been pursued, the performance that has been achieved and the financial results that have been realized.

*The Executive Board,*

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*Prof. dr. ir. C.J. van Duijn, rector*
*Mr. J.P. van Ham, member*
*Ir. H.P.J.M. Roumen, university secretary*

*Eindhoven, April 2012*
1. Mission and profile

Eindhoven University of Technology (TU/e) is a research-driven and design-oriented university of technology of international standing. Its focus is coherent education, research and knowledge valorization in the field of engineering science & technology.
In the field of education TU/e educates engineers (Master of Science/Ir.) who combine a solid scientific training and the competencies required to succeed in a wide range of societal sectors and jobs. In addition, TU/e educates designers (Professional Doctorate in Engineering/PDEng), researchers (Doctor of Philosophy/Dr.) and university-educated science teachers (Master of Science/Drs).

In the area of research TU/e focuses on the fields of engineering science & technology in which it can play a significant role in the international scientific community (science for science) and where it can provide meaningful impulses to solving the major societal issues (science for society) and strengthen knowledge-intensive industry (science for industry). Basic research driven by curiosity provides the requisite basis for more applied research. In the field of knowledge valorization TU/e is committed to ensuring that its research results are translated into successful innovations and new companies. TU/e encourages students and staff to be entrepreneurial.

The quality of the education and research complies with high international standards.

TU/e offers both students and staff an international and academic, intellectually stimulating, study and research climate. This inspires broad personal development, societal and cultural engagement as well as an entrepreneurial outlook. TU/e encourages the establishment and cooperation of higher education institutions, research institutes and (new) high-tech companies on its campus. The campus is developing into a TU/e Science Park of national significance and international allure.

TU/e is part of the 3TU.Federation together with Delft University of Technology and University of Twente. The mutual collaboration and cooperation are intended to strengthen the competitiveness and reputation of Dutch engineering science & technology universities in the world. Just as Delft and Twente, TU/e has its own identity and profile within the federation.

Mutual complementarity is the basis on which the University of Utrecht, the University Medical Center Utrecht and TU/e strengthen each other’s position through cooperation as preferred partners in a strategic alliance. The focus within this alliance is on key scientific and societal areas in which each supplements the other.

TU/e profiles itself as a leading international university specializing in engineering science & technology whose top-level education and research contribute to:
• progress in the engineering sciences;
• the development of technological innovations; and thereby
• the solution of major societal issues and the growth of welfare and prosperity.

It is, therefore, the engine of the regional knowledge economy. TU/e profiles itself as the university where innovation starts.
Profile TU/e
/ Where innovation starts

Research University in Engineering Science & Technology

Research

Education

Valorisation

For the benefit of
Society - Industry - Science

Strategic Areas
Energy - Health - Smart Mobility

Leading in
High Tech Systems & Materials
Chemistry & Chemical Engineering

Anchored in High Tech Eco System
Brainport Eindhoven (ICF Intelligent Community of the Year 2011)

Contributing to Dutch Economic Topsectors

Institutional Partner of
3TU. Federation - Delft University of Technology, University of Twente
Preferred partners - Utrecht University, University Medical Center Utrecht
National partners - Maastricht University, Radboud University Nijmegen, Tilburg University
EuroTech Universities - Danmarks Tekniske Universitet, Technische Universität München, École Polytechnique Fédérale de Lausanne
Global Partner - Zhejiang University
**Distinctive Research Areas**

- Automotive Systems
- Building Physics
- Broadband Telecommunication Technologies
- Complex Molecular Systems (ICMS)
- Human Behavior and Intelligent Systems (ILI)
- Information and Communication Systems (EIRICT)
- Logistics and Operations Management
- Multiscale Mechanics (EMI)
- Nano-Engineering of Functional Materials and Devices
- Plasmas
- Polymers
- Process Engineering and Control
- Tissue Engineering and Imaging

**Bachelor College - BSc**

**Undergraduate programs**
- Applied Physics
- Architecture, Building and Planning
- Biomedical Engineering
- Chemical Engineering
- Computer Science & Engineering
- Electrical Engineering
- Industrial and Applied Mathematics
- Industrial Design
- Industrial Engineering and Management Science
- Innovation Sciences
- Mechanical Engineering

**New majors**
- Automotive
- Medical Sciences and Engineering
- Psychology & Technology
- Software Science
- Sustainable Innovation
- Web Science

**Graduate School - MSc - PDEng - PhD**

**Master’s programs**
- Applied Physics
- Architecture, Building and Planning
- Automotive Technology
- Biomedical Engineering
- Building Services
- Business Information Systems
- Chemical Engineering
- Computer Science and Engineering
- Construction Management and Engineering
- Electrical Engineering
- Embedded Systems
- Human-Technology Interaction
- Industrial and Applied Mathematics
- Industrial Design
- Innovation Management
- Innovation Sciences
- Mechanical Engineering
- Medical Engineering
- Operations Management & Logistics
- Science Education and Communication
- Sustainable Energy Technology
- Systems and Control

**TU/e in figures 2011**

**Students**
- BSc – 4750
- MSc – 2950
- PDEng – 250
- PhD – 1200

**Scientific staff**
- Tenured – 550
- Non-tenured – 1450

**Publications**
- Web of Science – 1400
- Cit.impact score – 1.71
- Co-publications with Industry – 14%
- International co-publications – 53%

**Budget**
- Total – 300 mln
2. Strategic Plan TU/e 2020 and recent developments

At the start of 2011 TU/e presented its Strategic Plan 2020. Key ambitions are a growth trajectory for the next ten years towards a larger and more varied production of engineers, more intensive R&D cooperation with high-tech industry and other high-tech sectors, and a TU/e Science Park of national significance and international allure.
A wide range of reasons exists why TU/e has opted for a growth strategy. First, major societal challenges demand new technological concepts. Additionally, the high-tech industry in the Brainport region and the rest of the Netherlands needs many more engineers than are trained nowadays. Finally, the international competition for good students and researchers and the competition within the scientific world is becoming increasingly fierce. Not only quality but also scale is important to play a significant role, to be able to invest and to appeal to industry as well as to be sufficiently visible to international talent. Growth in education and research is essential for the university to fulfill its role in society.

Strategy in a nutshell

In 2020 TU/e has a leading position in the world as an international research university in engineering science & technology. It is known for its considerable scientific and societal impact and for the major impact it has on the competitiveness of Brainport Southeast Netherlands and the Dutch knowledge economy.

In the Strategic Plan TU/e 2020 the following goals have been set to achieve this:

Education
- Cluster Bachelor studies in the Bachelor College and completely redesign the Bachelor education
- Cluster graduate programs in the Graduate School
- Realize high success rates and an ambitious study climate
- Internationalize the student population and education
- Boost student intake via adequate marketing of a renewed range of programs
- Reflect on postgraduate education

Research
- Strengthen excellence in disciplines
- Realize TU/e Strategic Areas on key societal issues (Energy, Health, Smart Mobility)
- Stimulate innovative multidisciplinary research initiatives
- Develop highly promising R&D institutes in key niches
- Strengthen international research position

Knowledge valorization
- Realize more planned and structured R&D cooperation with high-tech industry
- Boost the effectiveness of knowledge and technology transfer to SMEs
- Boost participation in entrepreneurship education
- Boost the number of successful start-up companies

Campus
- Transform the campus into TU/e Science Park of national importance and international allure

Conditions
- Secure the required investments (600-700 million euros)
- Provide opportunities for top talent, more women and foreigners in scientific positions
- Ensure that the organization is in tune with strategy, clustering departments if necessary
- Benchmark central support services
- Take steps towards the ‘digital university’
- Develop an international university culture
- Promote clustering of research strengths in the Dutch technology sector
Core values
In implementing the strategy, TU/e employs the following core values:
• The academic character of the university and the scientific independence and integrity of the academic staff are leading. Researchers are provided opportunities and academic freedom to undertake basic research on the basis of their inquisitiveness.
• International excellence in the various disciplines is a primary requirement to pursue successfully interdisciplinary and multidisciplinary challenges.
• A strong interaction of the university’s core tasks -education, research and knowledge valorization- is regarded as self-evident.

The university strives for a strong interaction with its societal surroundings. Its distinctiveness comes from its close ties with high-tech industry and through an excellent relationship with local, provincial and national governments.

New developments
Since the publication of the Strategic Plan TU/e 2020 in January 2011 several new developments have occurred at regional, national and international level of which the implementation of the strategy has to take account.

Brainport 2020
At the start of 2011 the Southeast Netherlands Brainport region presented its strategy for 2020. It is the aim and ambition of Brainport 2020 to belong to the top 3 economies of Europe and the top 10 worldwide. It will do this by strengthening and linking the existing top clusters, through cooperation with all the regional networks and through the development of new clusters, such as smart mobility, energy and smart care. TU/e contributed to the Brainport strategy and, of course, is participating in the implementation program that is linked to the strategy.

Quality on diversity
In his Strategic Agenda for Higher Education (‘Quality in Diversity’) the secretary of state for Education, Culture and Science (OCW) indicated in 2011 that he strives for a stronger profile of higher education institutions, a more ambitious study climate and the development of research clusters.

Top sectors
The top sectors represent a new industry policy from the Minister of Economic Affairs, Agriculture and Innovation (EL&I) in 2011. The government aims to deploy tax measures and a revolving innovation fund in order to stimulate innovation-focused research and new business in nine economic top sectors, with industry being given a leading role throughout. At the same time the government is phasing out specific innovation subsidies and the natural gas revenues (FES) for research and innovation. TU/e has been involved in creating research roadmaps for top consortiums for knowledge and innovation (of industry and research organizations) by the top teams of the High Tech Systems and Materials, Chemistry, Life Sciences & Health, Energy, Logistics and Creative Industry top sectors as well as the cross-cutting theme of ICT.

Horizon 2020
The European Union presented Horizon 2020 at the end of 2011 as a new framework for funding research and innovation. The plan contains three key policy lines: to stimulate research excellence, to promote industrial leadership and innovation, and to tackle major societal challenges. Total spending will be around 86 billion euros for 7 years, of which some 13 billion will be awarded via the ERC and 3 billion via the European Institute of Innovation and Technology (EIT). This means that more funding for research and innovation will become available from Brussels.
Common goals

These developments support the strategy set out by TU/e. The priority themes of Brainport 2020 seamlessly fit the Strategic Areas of TU/e and the triple helix approach enabling TU/e the scope to further develop its role as the publicly funded research partner of industry and society. The goals and strategy of OCW are also an excellent fit with the TU/e activities of recent and future years: a clear profile in respect of clustering strengths with national and international partners, a strong focus on improving graduation rates and the strengthening and renewal of research cores. The Sector Plan Technology Implementation 2011-2015 of the 3TU.Federation has the same priorities.

The Dutch top sectors and the European Horizon 2020 will become the main program frameworks for public-private partnerships over the coming years. A solid basis for a key role in the Top Sectors and Horizon 2020 is formed by the accumulated experience and networks in Technology Top Institutes (TTI’s), successful participation in the Seventh Framework Program (FP7), including the Joint Technology Initiatives (JTI’s), the programs of the European Research Council (ERC) and participation in the Knowledge & Innovation Communities InnoEnergy and ICT Labs of the European Institute for Innovation & Technology top sector.

R&D lines of action

Although the recent developments intrinsically mirror the ambitions of TU/e, it must be realized that with a further decline in state funding, the possibilities to acquire external funding will be even more uncertain. This is especially so given the considerable reduction in government funded R&D and uncertainty about the extent of available funding in the top sectors. The result will be less research funding and fewer PhDs.

TU/e is confronting this reduction by focusing on four lines: establishing consortiums with industry via the Strategic Areas Energy, Health and Smart Mobility, strong participation in Horizon 2020, focused participation in the top sectors, and an intensification of knowledge valorization at TU/e, for which the prospects are promising. A sufficient base funding of the university is a first condition: these programs work as multipliers, whereby external funds are acquired on the basis of our own investment, without which no such multiplier is possible.

TU/e in the starting blocks

The TU/e strategy opts for educational innovation, research cores and an effective approach to knowledge valorization. One is not feasible without the other: an increase in student numbers can only be achieved by an increase in the number of researchers. Given the serious shortage of quality labor in the high-tech sector and the need for internationally competitive knowledge, TU/e can only fulfill the role of engine of the high-tech sector and innovative industry if this growth can actually be achieved.

It is obvious that the growth ambition for 2016 and 2020 represents a major challenge. TU/e is already in the starting blocks. Cooperation with government, industry and fellow research organizations in the Netherlands and internationally is essential to realizing the goals of the Strategic Plan 2020 and achieving maximum impact with the funds that are available for education, research and knowledge valorization.

At the end of 2014, the midway point of this institutional plan, the goals for 2016 and 2020 will be evaluated. At that moment in time the first couple of years of the implementation of the Strategic Plan 2020 will be behind us and the financial prospects will have become more evident.
3. Societal profile

“To ensure that research responds flexibly to dynamic external developments and to strengthen the societal and economic impact of the research, TU/e is concentrating its distinctive disciplinary research strengths in Strategic Areas around a limited number of major societal issues. The Strategic Areas will serve as an interface between chairs and sub-departments within the university, on the one hand, and with non-governmental bodies, companies and other knowledge institutions with whom TU/e develops and shares knowledge for application within society, on the other hand. They strengthen the social profile of the university, its revenue capacity in secondary and tertiary funding plus its attractiveness to potential students”.

TU/e Strategic Plan 2020
In 2011 it was decided to opt for three Strategic Areas – Energy, Health and Smart Mobility – within which consortia will be created with NGO’s, industry and research institutes and enable TU/e to develop and realize joint research and valorization programs. These themes are also clearly evident in the studies offered by and in the external profiling of the university: these are the pre-eminent societal challenges on which TU/e works.

3.1 Strategic Area Energy

“Energy supply solutions require perseverance. But if people really want, they can achieve a lot. In the seventeenth century we were still burning wood, and then we turned to coal and oil. We have now entered the era of cleaner energy sources.”

Rick Harwig, director of TU/e Strategic Area Energy

Through the Strategic Area Energy TU/e focuses on new technological solutions for societal problems like exhausted fossil fuels, the harmful effects of energy use on the environment, climate change and the growing need for energy of emerging economies. The ultimate goal is clean energy that can service the needs of tomorrow. The source or mix of sources that our society will use in the future will differ by situation, city, region and country. The past fifteen years reveal a more decentralized form of energy supplies, such as solar panels on roofs, and consumers who are more conscious of the energy they consume. Buildings in the future will be able to supply their own energy needs, in part or in full. Another major trend is the emergence of electric driving, which only increases demand for sustainable electricity. These trends signify a major change compared with today. How buildings will no longer use energy yet offer more comfort, how cars will have a more extended range on a single battery, how large vehicles will use clean fuels and how nuclear fusion can be an inexhaustible source of energy: these are key research issues for TU/e. Energy is an excellent area in which TU/e can contribute strongly to tackling societal challenges.

Research themes

There are four research themes in the Strategic Area:

- Built Environment
  Saving, generating and using energy in a building, district, city or region. This concerns aspects like smart grids, building management systems, insulation, urban planning, batteries, thermal energy storage and ways of regulating living comfort.

- Energy Conversion
  Converting sustainable sources into energy such as various kinds of solar cells to convert sunlight into electricity and into solar fuels.

- Future Fuels
  New fuels from sustainable sources combined with the development of engines that enable very clean combustion.

- Fusion Energy
  Solving various issues to arrive at a large-scale energy-producing reactor for nuclear fusion and thus contributing to the development of the ITER reactor in Cadarache, France.

Some 400 TU/e researchers are active in this area, with the accent on top-quality fundamental research and on innovation through cooperation with industry. In addition to the development of technology, the research investigates the acceptance and use of energy technology by consumers.
KIC InnoEnergy
TU/e is partner in the European Institute of Innovation and Technology, KIC InnoEnergy, whose aim is to become Europe’s main energy innovation network. TU/e also participates in SoPliance, an alliance of TNO, TU/e, Holst Centre, ECN, IMEC and a number of solar energy companies. TU/e is also co-initiator of ‘Smart Energy Regions’, a network of companies, NGO’s and research institutes that focuses on the development and implementation of ‘smart’ energy technology by and in the province of Noord-Brabant and the high-tech region Brainport. The Smart Energy Regions project is a key engine in this. In 2015 the Dutch Institute For Fundamental Energy Research (DIFFER) of FOM will be located in the TU/e Science Park. In the preferred partnership with the University of Utrecht and the UMC Utrecht there have been joint projects in the area of energy since 2011. Extending and utilizing these networks is one of the main goals for the coming years.

Center for energy research
These networks and clustering of strengths help to nurture the development of Eindhoven and TU/e as a center for energy research with international allure. The students will also reap the benefits, in part through the Erasmus Mundus Master program SELECT and the Smart Energy Buildings & Cities designer program (both supported by the KIC InnoEnergy), through the 3TU Master program Sustainable Energy Technology and through the Science and Technology of Nuclear Fusion Master program that is in preparation.

The ‘energy’ theme will be evident in many studies in the Bachelor College. The TU/e Science Park will also act as a test bed for new energy technologies and the university will reduce its own energy use as much as possible.

The close ties in the region and the large national and international networks enable TU/e to use its international position to play a valuable role for industry. TU/e will therefore cooperate with industry to focus strongly on participation in Horizon 2020, the KIC InnoEnergy and the top sector Energy.

Roadmaps
From 2013 to 2016 research and valorization roadmaps for the next ten years will be developed for each of the four themes and TU/e will form consortiums with NGO’s and private partners. Compared with 2010 significantly more MSc’s in the energy domain will be educated and the number of PDEng’s will increase. The focus when forming consortiums and in educating students is international: energy is a key research and innovation theme globally and on a European level, and there is considerable international interest in energy studies.

Intended results
• The TU/e Science Park is a renowned center for energy research, whose players include TU/e, FOM and the EIT KIC InnoEnergy.
• TU/e researchers are among the best worldwide in the fields of nuclear fusion, solar cells, future fuels, process technology and energy in the built environment.
• The Master’s intake for Energy will rise from 70 in 2011 to 105 in 2016.
• The external funding for research in the field of Energy will be at least the same in 2016 as its peak in 2011 (15 million euros).
• The Smart Energy Regions network has 150 partners in the Brainport region and works very closely with innovative regions throughout Europe.
3.2 Strategic Area Health

“The costs of care in the Netherlands and elsewhere in the world are increasing. Furthermore, there is a growing threat of a shortage of personnel. We must therefore realize technologies that will make care more efficient. In my dream of the future a hospital will have hardly any beds because diseases will be prevented and treated without the need to perform an operation.”

Roel Fonville, director of the Strategic Area Health

By making care person-centric, technology can help reduce costs and boost the quality of life by using domotics (home automation) to enable in-home care, through a stronger focus on prevention and to enable medical specialists to work more efficiently. Altogether, this signifies a major change and a consequent need for new applications based on new concepts that derive from the interaction between medical and technological disciplines.

TU/e can make a significant contribution to solving societal problems in the care sector, with over 250 researchers from all the departments working together to push the boundaries of this Strategic Area. Working at the interface of disciplines brings new insights to solve complex medical issues. Through the traditionally strong ties with industry and care institutions, the new technological concepts that are developed by the university can be translated into the development of new products and services.

Themes

Three themes are central:

- **Smart Environment**
  Techniques that enable an extended period of independence and thus reduce the load on primary and secondary care. This concerns, for example, the design of the immediate surroundings, ICT integrated in clothing and human-centric information and planning systems.

- **Smart Diagnosis**
  Research into non-invasive diagnostics, techniques for measuring physical functions, looking into the body and giving a fast, reliable measurement. These new diagnostic techniques are important for both primary care and self-help. They give the patient more influence on and insight into himself. Such techniques include imaging and biosensors.

- **Smart Interventions**
  Research into effective interventions of very high quality, painless and fast, which generate the required result first time around and ensure that the patient can return home quickly. TU/e has relevant knowledge and expertise in a wide range of areas like image-guided non-invasive interventions, tissue engineering, discharge plasma medicine and telerobotics.
Top-level research
The study and application of technology in care require broad expertise – from home care to clinical hospital care – and the involvement of many disciplines. First and foremost, research of a top international level is needed and, with a view to this, TU/e researchers collaborate with top researchers in the Netherlands and abroad. Over the next few years TU/e will extend cooperation with the UMC Utrecht, the Maxima Medical Center and the Catherina Hospital. In addition, the university medical centers of Nijmegen, Maastricht and Amsterdam are important partners in projects. Participation with foreign partners in a KIC Health Technology of the European Institute for Innovation and Technology (EIT) is also a goal.

Imaging
In 2012 the UMC Utrecht, the University of Utrecht, Eindhoven University of Technology and Philips founded the Institute for Diagnostic and Interventional Imaging (IDII). This consortium focuses on developing new image-controlled minimal intervention treatment for cancer, brain diseases, and heart and vascular diseases. By sharing knowledge and expensive facilities in the UMC Utrecht and at the High Tech Campus Eindhoven, cooperation is strengthened and innovation accelerated. The results of the consortium will be translated into the industrial production of new systems that can be used in clinical practice. In 2016 this consortium will become fully operational.

Test beds
The development of a high-tech infrastructure for open innovation in the medical-technological field, such as the Imaging Facility and ‘Slimmer Leven 2020’, involves the networking of many parties within the Brainport region. These networks will be at the heart of the development of test beds and living labs to test new technological concepts in a realistic context.

Qualified personnel
In this context there will also be a firm accent on the education and supply of sufficient well qualified personnel. In both the high-tech and care sectors the demand for qualified technical-medical personnel is particularly high. Together with the University of Utrecht TU/e aims to provide a versatile range of studies that enables students to pursue clinical and/or technological studies. In the next few years a number of new majors and Master programs will begin, whereby efficient learning paths will also enable talented students to become both an engineer and a physician.

Transition
In cooperation with industry TU/e will enable innovations that shape the transition to a care system of lower costs and higher quality of living. The cooperation with SME’s and a number of major corporates like Philips Healthcare in an international context will be consolidated. ‘Health’ is a major societal challenge throughout Europe and beyond. In the Strategic Area thematic roadmaps will be developed geared to focus, critical mass and quality within the research domains. TU/e will use these roadmaps as a basis for consortium formation with public and private partners, including those in the top sectors High Tech Systems and Materials and Life Sciences & Health and in European Horizon 2020 programs like Active Living and Healthy Ageing.
**Intended results**

- In cooperation with partners TU/e plays an international role in scientific fields that relate to the central themes of the Strategic Area, like Medical Imaging, Regenerative Medicine, Minimal Invasive Technologies and Remote Sensors.
- TU/e is a significant contributor to the regional LIFETEC and ‘Slimmer Leven 2020’ initiatives and participates in themes related to Brainport Living Labs for Health.
- The Master’s intake in the area of Health will increase from 60 in 2011 to 90 in 2016.
- In 2016 external funding of Health related research will reach at least the same peak level as in 2011 (13 m).
- Participation in an EIT KIC in the area of Health.

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### 3.3 Strategic Area Smart Mobility

“Mobility has brought us much prosperity but also some ills, like traffic accidents, traffic jams, pollution and fossil fuel consumption. Nevertheless, I am optimistic about the future. New technologies will offer solutions to societal problems to ensure that we can continue to travel the world in the future.”

Carlo van de Weijer, director of the Strategic Area Smart Mobility and vice-president of business development traffic solutions at TomTom.

Developments in traffic and vehicles take place very rapidly, with cars already having more than 60 processors to help make them safer and more fuel-efficient. New forms of cruise control and car-to-car communication will enable vehicles to anticipate the behavior of other vehicles, with braking, accelerating and even merging becoming automatic maneuvers depending on the data the vehicles get from each other. ‘Reading the newspaper at the steering wheel’ is not an unrealistic notion. In freight traffic new logistics and information systems will be intelligently and efficiently deployed and make journeys a seamless series with fewer ‘empty kilometers’ and lower costs as a result. Intelligent traffic and navigation systems will tell every road user not only the fastest route but also, in a manner of speaking, whether it would be better to first do the groceries before taking a package to the post office.

The solutions generated for society are geared to two issues: the more intelligent and productive deployment of mobility and the more sustainable – cleaner, safer and more fuel-efficient – transport of people and goods.
Smart Mobility is a societal challenge for which TU/e has considerable knowledge and expertise in house in a whole range of fields, from planning, logistics, traffic management, traffic safety and clean vehicles. Some 250 researchers at TU/e are tackling this challenge with a combination of automotive, ICT and logistics that is unique in the Netherlands.

Themes

The following themes are leading:

- **Automotive Technology**
  The integration of the growing number of in-car, high-tech systems aimed at creating cleaner, more fuel-efficient and safer cars.

- **Intelligent Transportation Systems**
  The concept of the Connected Car, the computer controlled car that communicates with other cars. A combination of sensors, real-time control options and communication networks enables cars to interact with each other and their surroundings.

- **ICT/Embedded Systems**
  The development of embedded systems in vehicles and of intelligent software that allows the vehicle to adapt to the user and react to external signals.

- **Mobility & Traffic**
  Advanced computer models that simulate the way people move through public areas with or without a vehicle. This information can be used for making policy on spatial development, urbanization, energy, public transport, the laying of networks and predicting as well as restricting or even solving traffic jams.

- **Transport & Logistics**
  The total supply chain, a close integration of transport and logistics using advanced ICT systems requiring conceptual modeling of supply chain management and traffic management.

Studies

For students a versatile study program is available, such as the study of Logistics in a Master and Designer program as well as automotive studies across the whole Bachelor, Master and Designer range – something that is unique for the Netherlands. TU/e strives to achieve strong growth in the number of students in automotive and logistics studies so that industry demand for highly qualified personnel can be met. The aim for 2016 is an increase of 50%.

Safer and more sustainable

In cooperation with partners in the high-tech and logistics sector, in the Brainport Southeast Netherlands region and beyond, TU/e will take up the societal challenge to make mobility cleaner, safer and more sustainable. The Dinalog Campus in Breda, AutomotiveNL, Dutch Integrated Testsite for Cooperative Mobility (DITCM), European Supply Chain Forum and Green Car Initiative are the most prominent knowledge partners. Other companies and institutions also involved in the Strategic Area include DAF, TomTom, NXP, VDL, Bosch Transmissions, Corus, Nedcar, DTI, TNT, TNO, Prodrive, Unilever and the Ministry of Infrastructure & the Environment.

Roadmaps and consortiums

In the next few years TU/e will shape roadmaps and consortiums with other key societal partners and companies. The focus will be on both national initiatives, like the top sectors High Tech Systems and Materials, Energy and Logistics, and on international developments as evident in the close ties with other logistics top regions like Waterloo in Canada and the German Ruhr, and the strong ties with the automotive industry, particularly in Germany.
**Start-ups**
A final important goal for the coming years is to support a substantial number of new start-ups in the field of Smart Mobility: many automotive components and new logistics concepts and applications are perfectly suited to the capacities of small innovative companies. The TU/e Science Park will act as a ‘living lab’ and test bed for new applications. Close cooperation between government and major companies could boost the international reputation of the Brainport Southeast Netherlands region and TU/e as a key center of knowledge and innovation in the field of mobility.

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**Intended results**

- Increased Master’s intake in the field of Smart Mobility from 110 in 2011 to 165 in 2016.
- External funding for Smart Mobility research in 2016 at least at the same peak level of 2011 (€9m).
- The Strategic Area Smart Mobility will be recognized by industry at home and abroad as a major source of innovation and knowledge.
- The models and technologies co-developed by TU/e will make a significant contribution to policymaking in the area of traffic and transport.
“In 2020 TU/e will respond to the need of society and the knowledge industry for different kinds of academically trained engineers, technological designers and researchers. A differentiated range of course programs will respond effectively to the different reasons why different groups of students choose to study particular subjects and to the need for different types of technological knowledge workers in the labor market. The study climate will be challenging and motivating. Education and the student population in 2020 will be very international.”

TU/e Strategic Plan 2020
Between 2013 and 2016 TU/e will see a radical redesign of its Bachelor study program as all the Bachelor studies come within the TU/e Bachelor College. The Master, technological designer and PhD programs will be clustered in the TU/e Graduate School and thus gain more cohesion and international profile. Every effort will be made to reduce the drop-out rate and boost graduation success. High standards of quality will ensure that TU/e produces the best engineers and researchers. The number of foreign students in Bachelor and Master programs will rise considerably over the next few years while Dutch students will increasingly gain foreign experience. Finally, TU/e will develop a vision of its role in terms of the increasing societal demand for lifelong learning.

4.1 Bachelor College

In June 2011 TU/e began to radically reform its Bachelor study programs to make them more attractive, more challenging and more feasible for both the intrinsic science students and for the people-oriented and career-oriented science students. The aim is to meet the huge demand from industry, in the Brainport Eindhoven Region and throughout the country, for more and more diverse engineers. Despite the high intrinsic level of the Bachelor programs at TU/e, the student intake and graduation rate are too low, which means that TU/e cannot fulfill society’s need for engineers. A whole range of separate measures to come to grips with this has not delivered sufficiently, so a more fundamental and coherent approach has been adopted. The Bachelor programs have been better structured, intrinsically refreshed and now come together under the single umbrella of the TU/e Bachelor College.

Attractive Bachelor

To date TU/e has attracted mainly students with a natural interest in sciences and technology, the concrete sciences. The Bachelor College sees TU/e also focused on the so-called career-oriented science students and people-oriented science students that also include many women with scientific talent. The intake of Bachelor students from now until 2020 will have to rise to at least 1700 per year. In order to achieve this growth TU/e is enhancing the attractiveness of the programs. They are more challenging and more promising for all those high-school pupils that have Natural Sciences & Health and Natural Sciences & Technology in their study profiles. TU/e also wishes to attract extra students by expanding its recruitment area to the whole of the country and neighboring countries.

Study structure

The redesigned Bachelor studies contain a major (90 credits), a basic component (30 credits), a USE component (15 credits) and electives (45 credits). In the electives attractive coherent packages of 15 credits, disciplinary and interdisciplinary, are offered on challenging themes such as the Strategic Areas. Students can opt to dig deeper into their own discipline or to look beyond its boundaries. They can direct their own studies and develop into a unique professional. In order to offer existing and new target groups greater choice, new majors are also being offered in the existing study programs. Lecturers offer proper coaching to ensure that well considered choices are made and coherent study paths chosen.

Graduation rates

The current Bachelor graduation rates are too low: about 40% of the students drop out in the first year and just 35% of the students who continue after the first year graduate within four years of the start of their studies. TU/e aims to double that percentage in 2020 to 70%.
There will be a range of innovative initiatives undertaken to achieve this. Standardizing the subject scope allows for horizontal programming that gives students more flexibility to follow an individual path of study. A maximum of three subjects at the same time prevents overload for students. More student-activating forms of study are being employed. By checking the study component more frequently, a student will be better able to spread his or her study commitment and testing will be made more reliable. The definitive grade will no longer be determined by the final examination alone. Furthermore, all students that enroll will have an intake interview and the lecturers will intensively coach students in their study path choices.

Society need
The Bachelor College is a response from TU/e to the growing societal need for more engineers and for different kinds of engineers. Because society doesn’t just need engineers but also a greater variety of engineers. There is no such thing as a ‘engineer of the future’. Instead we should think of various ‘engineers of the future’: engineers with very diverse profiles. This differentiation is especially relevant in the Brainport region, the technological heart of the Netherlands and one of Europe’s technology top regions. This need is also prominent in the Human Capital Agendas and the Science and Technology Master Plan of the top sectors.

In addition to engineers with in-depth knowledge in one technological discipline, engineers are needed that can link different technological disciplines and/or link engineering disciplines with humanities and social sciences. There is an urgent need for engineers who are able to transform, as entrepreneurs, that technological knowledge into socially and economically attractive innovations.

A higher Bachelor intake and better graduation rates should lead not only to a strong growth in the intake of students in Master programs and the graduation of more engineers from these programs but also to greater diversity in the graduation profiles of engineers.

Intended results

- Successful implementation of the in the Program for the Redesign of Bachelor Studies developed plan for the innovation of Bachelor education.
- Continuation of the high level of student satisfaction, as evident from student assessments per study in the NSE and subject evaluations.
- Higher intake in Bachelor studies from 1190 in 2011 to 1540 in 2016.
- Strong improvement in graduation rates: more than 55% of re-enrollers completing their studies within four years of beginning.
- At least 10% of the students stand out as excellent students via different challenging programs.
- The Strategic Areas are well embedded in the Bachelor studies via coherent packages, including degree programs.
4.2 Graduate School

Post-Bachelor studies that comprise both departmental graduate programs and interdepartmental, thematic graduate programs were clustered in the TU/e Graduate School in 2011. This enables the Master (MSc) and Designer (PDEng) studies and the PhD programs to gain an internationally recognizable profile. Moreover, the coherence between the three is strengthened through this clustering. Excellent students can also make the step towards a Designer or PhD program during their Master studies.

This will help TU/e to attract more students from around the Netherlands and abroad. The Master studies intake is crucial for the education of the number of engineers that industry needs. A key condition for a higher intake is an internationally recognizable and a qualitatively high level of studies that also allows for the personal preferences of the student.

Coherence
The Graduate School comprises 15 graduate programs, each of which is geared to one discipline or interdisciplinary theme. Each graduate program contains one or more Master or Designer programs and various PhD programs. Education and research are, naturally, closely intertwined within the graduate programs. Since much TU/e research is carried out in collaboration with industry, students will be prepared perfectly for a role as an engineer, designer or researcher in industry or for a role as a researcher at a research organization. Also by following short certification programs aimed at entrepreneurship, for example, and which can easily be incorporated within the study, students can acquire the competencies they want.

Quality and excellence
For excellent Master students who have proven themselves capable of taking on an additional study load it will be possible during their Master’s study to undertake components of a Designer or PhD program. Excellent students are thus able to prepare for a PhD or PDEng study.

The current MSc, PDEng and PhD programs of TU/e are of high quality. Industry, too, confirms that graduates are of the right level. By giving the Graduate School a central role in ensuring the quality, the quality assurance can be extended and made more efficient. This also applies to the quality assurance in the PDEng and PhD programs.

International recruitment and experience
The TU/e Graduate School will fulfill an important coordinating role in the international recruitment of potential MSc, PDEng and PhD students with the employment of various means: an intensive profile of the study program range and career opportunities in the Brainport region, funds for MSc and PhD grants and agreements with partner universities on joint graduate programs.

TU/e strives for almost every student to gain international experience during his or her studies. This means following programs with students from other foreign institutions (by distance) or spending a period at a foreign institution. In addition to developing subjects in cooperation with foreign institutions, the Graduate School will focus on preventing delays in study through foreign study.
4.3 Postgraduate education

Post-initial education (postgraduate study) is vital for high-tech industry and thus for the Brainport region. It is crucial that companies and personnel have the most recent knowledge and expertise in their field and continue to develop these during their careers. In the national Science and Technology Master Plan this is referred to as 'bind, captivate and develop' and is one of four spearheads to solve the considerable shortage of potential labor for the engineering industry. There is also a great need in industry for post-initial education in the area of management and business administration, for instance for engineers that want to grow into management positions.

Lifelong learning

The Bachelor College and the Graduate School is a response to the demand from innovative industry for high-tech knowledge workers. TU/e postgraduate education responds to the need among these professionals for university-level lifelong learning.

Postgraduate education comprises studies and courses subsequent to the completion of an initial education, usually a Master, and entering employment. In the area of postgraduate management studies TU/e has long worked with the University of Tilburg in the TiasNimbas business school. As for post-initial studies in the field of physics and engineering, TU/e is still very modest in its profile. TU/e is therefore reviewing its role and position in this respect and will present a vision and implementation plan at the beginning of 2013 targeting the offering of short courses and training in physics and engineering sciences with a certificate. These short courses and training will be offered via open registration at TU/e and in-company.
Demand-driven
The content of these studies will be designed in close consultation with professional associations like KIVI-NIRIA, companies in the Brainport region and umbrella organizations. Demand from companies and their personnel will be leading for TU/e’s postgraduate studies.

It is also important that the TU/e offer in postgraduate education is clear and accessible for companies and other organizations. Postgraduate education in physics and engineering sciences will therefore be conjoined in a university-wide office before being developed further.

Intended results

- Clear TU/e proposition at the start of 2013 for postgraduate physics and engineering science education and the development of a range of studies for 2013-2016 on the basis of this proposition.
- Growth of the number of postgraduate education (excl. TiasNimbas) participants from 100 per year in 2013 to at least 250 per year in 2016.

4.4 Quality assurance of education

Education at TU/e is comparable with the best technology universities in the world and demonstrably complies with the highest international quality standards. This is the opinion of fellow researchers and lecturers, independent accreditation bodies and, most importantly, the students, alumni and their employers. This is backed by satisfaction surveys undertaken by Elsevier, the Higher Education Study Guide and the Times Higher Education ranking. It is a constant challenge to uphold these positions and, where possible, improve on them.

ACQA
TU/e educates its engineers (MSc), designers (PDEng) and researchers (PhD) for a variety of jobs in industry, society and science. The intrinsic profile of the studies is adjusted to the need. To monitor the quality of the education, TU/e uses the Academic Competences and Quality Assurance (ACQA) system it helped to develop. This system will be further developed in the next few years with partners at home and abroad.

BKO
TU/e has opted to use the BKO (basic educational qualification) as a prerequisite not just for found shortcomings but also for new appointments and promotions of lecturers. To further embed internal quality assurance in the organization – which is firmly rooted in the departments – the Bachelor College and the Graduate School will take on a central role supported by the Central Committee for Quality Assurance for Education (CCKO). This is also intended to make the quality assurance processes more efficient.
**Institutional check**

Based on this internal quality Assurance, in 2013 TU/e will be subject to the NVAO institutional quality assurance assessment, a basic prerequisite in the higher education system. TU/e will also review to what extent special hallmarks such as ‘internationalization’ or ‘entrepreneurialism’ can be obtained for specific programs in their accreditation. Hence the reason for TU/e’s participation in the NVAO pilot ‘special entrepreneurialism hallmark’.

**Rankings**

TU/e will also take a good look at profiling the quality of the studies internationally in addition to participating in the Center for Higher Education ranking, for instance by participating in the U-Multirank that is under development.

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**Intended results**

- Acquire the NVAO institution check for institutional quality assurance and the special ‘entrepreneurialism’ hallmark.
- TU/e is the best Dutch technology university and is among the 10 best technology universities in Europe in different educational rankings.
- Share of lecturers with BKO to rise from 12.5% in 2011 to at least 20% in 2016.
- Companies and other relevant employers in the Brainport region revel particular satisfaction with the educational level of TU/e graduates.

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**4.5 Internationalization of student population and education**

Demand from industry and science for highly qualified, internationally oriented engineers is considerable. TU/e sees serving the employment market well as as part of its vital societal duty to, significantly increase student and graduate numbers in view of the huge shortage of suitable labor. Given the considerable barriers Dutch students experience to studying Science & Engineering Masters, the intake of foreign students will have to increase significantly.

In addition to more engineers, companies also demand engineers that can deployed throughout the world, so it is essential for students to gain international experience during their studies. TU/e aims to be a truly international community in which natural interaction takes place between all students and staff, Dutch and international.

**International student intake**

In order to boost the intake of international students, TU/e is focusing on a number of initiatives such as the Amandus Lundqvist Scholarship Program (ALSP) aimed at expanding the number of international students and the Erasmus Mundus (Erasmus for All from 2014) program to boost the number of joint degree programs. TU/e will also actively recruit students in the target countries of Brazil, Mexico, India, China, Spain, Greece and the United Kingdom, and ask international students and alumni to be ambassadors for TU/e. The TU/e Career Center will do its best to retain international Master graduates and PhD and PDEng students for the Brainport region.
Internationalizing study programs
Over the next few years TU/e will invest in internationalizing the curricula. The engineering profession is becoming increasingly international and TU/e graduates are expected to have the right competencies to work in an international setting. TU/e programs will therefore offer students international exposure in the form of active participation in an international program or project. This may be via a ‘virtual campus’ setting, whereby students can work together on a project in two separate locations via Skype, for instance, of follow studies at a foreign partner university. To support this TU/e will expand the current structural partnerships with highly qualified foreign universities. More international scientific academic staff will be appointed and TU/e staff will have extra training if needed in respect of working with international student groups.

International community
To boost the international appeal of TU/e to future and current international students and knowledge workers, and to enable Dutch students to become acquainted with other cultures and groups of students, TU/e is focusing on developing into a truly international community. This means dissipating language barriers as much as possible so that foreign students can also participate in the university's democratic bodies. The international TU/e alumni working in the Brainport region will also be involved in the TU/e international community. Finally, TU/e will actively participate in the digital forums for international students and alumni to properly inform prospective and current students and get them involved in the activities of TU/e and in the city of Eindhoven.

Intended results
- Growth in the number of international Master students from 560 in 2011 to 620 in 2016.
- At least 25% of Dutch TU/e students will gain credits from a foreign institution.
- In 2016 TU/e will have smooth-running, well valued digital forums via the social media, geared to involving international students and alumni in the activities of TU/e and the city of Eindhoven.
5. Research and knowledge valorization

“The quality of TU/e research is among the best in the world. In 2020 TU/e will be distinctive through the innovative multidisciplinary research programs of young talented researchers and successfully positioned multidisciplinary R&D institutes in carefully selected niches. Curiosity-driven basic research will be given a lot of scope, a prerequisite to be able to remain relevant for the external environment in the long term. In 2020 TU/e will also have gained a leading position against the other Dutch universities in terms of knowledge valorization. There will be cooperation with industry and other relevant players in R&D throughout the entire knowledge chain. High-tech SMEs will make optimum use of the expertise of the university via proactive knowledge and technology transfer. Students and staff will be keen on starting up their own business. TU/e will stand out through the propagation of successful high-tech start-ups.”

TU/e Strategic Plan 2020
Excellence is essential for quality education, research and knowledge valorization. TU/e therefore puts excellence at the head of the basic disciplines and is subsequently committed to further strengthening focus and mass in research by clustering strengths in 13 specific fields of research, linked to scientific developments and societal needs. In addition, there is a commitment to scientific innovation, namely through specific support for innovative, multidisciplinary initiatives by young talented researchers. An excellent basis is thus created for knowledge valorization and TU/e can fulfill its role in respect to industry and society. The university is a major engine of the regional knowledge economy and the high-tech sector and is traditionally strong in the area of knowledge valorization. TU/e uses this experience to take further steps towards 2020.

5.1 Strengthening research excellence

TU/e is a top international player in a number of fields, specifically in enabling technologies for high-tech systems and materials, like polymer science, mechanics & control, nano-engineering and embedded systems. To maintain and stimulate the quality of these and (potential) other leading strengths TU/e is committed to ensuring an excellent basis in the disciplines and to innovative research in multidisciplinary initiatives and institutes.

Profile areas

The basis for research excellence for TU/e lies in the various research disciplines. In 2004 TU/e selected nine profile areas or distinctive research areas. Nurturing and maintaining the internationally high level of these areas enable a high level of education to be offered and scientifically interesting, new directions to be taken. The strong clusters in Communication Technology (COBRA), Multiphase Reactors (process technology), Complex Molecular Systems (ICMS) and Plasma Technology are good examples of this excellence.

These strengths are the result of the thorough long-term efforts of the departments and university for many years that have enabled a large number of VICI (NWO) and ERC grants to be acquired recently. TU/e has also succeeded in attracting talented researchers on this basis. To continue the current strong research profile in the next 10-15 years, TU/e supports its research strengths and pursues scientifically interesting new directions by developing multidisciplinary initiatives in niches, like the recently founded Eindhoven Multiscale Institute (EMI) and the Intelligent Lighting Institute (ILI). The High Potential Research Program, where a select group of researchers can focus solely on research, is also being established to explore these and other new directions.

Cooperation

More generic cooperation with other researchers and institutions whose international research is of the same high level is essential. The collaboration and cooperation within the 3TU.Federation and Centers of Excellence, the preferred partnership with the University of Utrecht and the UMC Utrecht as well as the cooperation within EuroTech Universities offer a proven and excellent basis for this. Cooperation with the TNO and FOM institutes and the Dutch Institute For Fundamental Energy Research (DIFFER) that will be located at the TU/e Science Park are also important in terms of collaboration and mutual reinforcement.
Linking to Strategic Areas
In offering opportunities to talented researchers, creating state-of-the-art research facilities and institutional cooperation, TU/e will look specifically at the developments in the Strategic Areas Energy, Health and Smart Mobility. Research quality and societal orientation will mutually reinforce each other.

Intended results

- TU/e is demonstrably among the international elite in at least five research areas.
- In 2016 a constant stream of 10 High Potential Research Programs, each lasting four years.
- TU/e to have excellent results in the ERC Competition and NOW Innovation impulse.
- TU/e to succeed in profiling socially the scientific strengths via the Strategic Areas Energy, Health and Smart Mobility.

5.2 Talent
Research and education are primarily the work of people. Top science academics ensure that TU/e plays a leading role in different domains and that students, designers and PhD’s are educated optimally. High quality is the basis for scientific breakthroughs, eye-catching research results, good education and a state-of-the-art service to society and industry. To continue to play a key role regionally and nationally, the scientific work must be of excellent quality and be commensurate with the international elite. So TU/e is strongly pursuing the attraction and nurturing of top talent, offering both young talent and the excellent senior scientist the scope to pursue their interests and a stimulating climate for excellent performance and personal development.

Scope for scientific talent
The heart of the approach is the scope that TU/e gives the talent. It starts with ‘scouting’ for highly promising talent and offering them a challenging position that stimulates their personal career and boosts their scientific development in their respective scientific field. Hence the very broadly formulated research themes for vacant positions or new professorships: the quality of a scientist is more central to selection than the extent to which the expertise of a candidate fits a prescribed job profile.
A talented academic is provided multiple opportunities to develop his or her career at TU/e. The ‘tenure track’ will be an obvious part of the career of a academic at TU/e. In a tenure track both the academic and the university invest in the possibilities to grow into a permanent, more taxing academic position. TU/e already has a high proportion of researchers on a tenure track. Research is a very competitive employment market: only very few incoming PhD’s will later gain permanent positions or become full professors. For those PhD’s who will pursue a career outside the academic world, TU/e offers facilities geared to preparing for such a step.

Mobility and, preferably, international experience is key to a academic career. TU/e academics regularly transfer to foreign institutions or form partnerships with these while many of the academic staff come from outside TU/e and a good proportion of them from outside the Netherlands. The international experience and diversity in the academic staff have significant added value in the achievement of scientific excellence.

**Top talent in research**

TU/e currently offers financial support to a select number of research talents, as in the High Potential Research Program. This enables them to continue to develop and further explore research themes of their own. TU/e also stimulates and supports the researchers to acquire individual subsidies, for instance from the Innovative Research Incentives Scheme (NWO) and the ERC, and to rapidly become independent and influential in the scientific world.

**Female talent**

In addition to international diversity, gender diversity is a TU/e goal, with the need to get more female science academics in top positions in the next few years a specific target. In 2011 more female professors and senior university lecturers (UHD’s) were appointed than in all previous years.

Each year TU/e offers three to five female science academics the opportunity to become a permanently appointed UHD within a Women in Science Tenure Track. TU/e has an active Women in Science Network (WISE) for and by female science academics and an ambassador network of leading academics from all the departments that help foster the intake and promotion of women to higher positions.

TU/e has set the target for 2020 of having at least 20% of its professor and UHD positions obtained by women. To achieve this female talent will be pro-actively scouted, talented women will be offered development programs, the shortlists of candidates for professor and UHD recruitment procedures will comprise women for at least a third, the appointment of female top academics will be done on the basis of an individual professorship and at least two women will participate in each appointments committee. In their result consultations the Executive Board and the departmental boards will also focus attention on the number of vacancies to be filled by women.
Support staff
Support staff also needs and deserves specific encouragement to professionalize and perform. The set of tools that enables auxiliary personnel to cooperate with the employer on professionalization of their current jobs and on preparation for the next stage of their careers, whether at TU/e or not, will be extended. Both professionalism and mobility can then be better attuned to the requirements of the organization and to enabling the employee enjoy a successful modern career.

Intended results
• The majority of the newly appointed academic personnel will have begun a career at TU/e on the basis of a tenure track.
• In 2016 there will be a constant 10 High Potential Research Programs, each lasting four years.
• In the period up till 2016 three to five WISE Tenure Tracks will be started each year.
• Substantial increase in the number of female university and senior university lecturers and professors in 2016
• Implementation and utilization of new and innovative tools for professionalization and career development for auxiliary personnel.

5.3 Research infrastructures
State-of-the-art research facilities are essential for the quality of the research and to attract international research talent. Such facilities also encourage innovative companies to locate in the area. TU/e recognizes the importance of this and a TU/e roadmap for research facilities will be drafted as a priority.

This roadmap concerns:
• clustering the wishes and needs in laboratories that are internationally competitive in terms of facilities and scale;
• structuring shared facilities that can be borne by several research organizations and companies and thus prove a magnet for other research organizations and companies to locate on the campus or in the vicinity of the university.

Making choices
There are a number of reasons why TU/e puts the research facilities on the agenda. First and foremost, the facilities, whether this is one device or a complete laboratory, are essential for research. Also some facilities, like the cleanroom, are very expensive and often beyond the financial reach of any one department or even the university. So, choices have to be made within the university. A TU/e roadmap that will appear at the start of 2013 will identify the possible choices, for which the national and international context is determined by the national roadmap of large-scale research facilities and the roadmap of the European Strategy Forum for Research Infrastructures (ESFRI).
There is also a growing industry need to use such advanced facilities for product development, as is the case at the Imaging Facility of TU/e and Philips at the High Tech Campus. By clustering strengths an internationally competitive facility is created. Also the cleanroom at the TU/e Science Park will allow industry access.

Region
Finally, TU/e along with the organizations and companies at the High Tech Campus and the High Tech Automotive Campus, Brainport, municipal and provincial authorities will consider how these regional research and innovation facilities can gain international allure by exploring the intrinsic focus and financing strategies. TU/e wants to realize one or two of these facilities in cooperation with partners during the period up till 2020.

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5.4 Knowledge valorization

TU/e was founded in 1956 to cater to the need of industry in the Southeast Netherlands for state-of-the-art technological knowledge and high-tech knowledge workers. TU/e has been known for its close R&D cooperation with industry ever since and it has the world’s highest number of co-publications with industry researchers. Graduates find their way into innovative industry, and technological inventions and knowhow lie at the basis of spin-offs and start-ups. The university participates with industry in many (inter)national public-private partnerships and entrepreneurship plays an important role in TU/e studies.

The role of the university in knowledge valorization and innovation has increased tremendously: the scope for in-company R&D is declining, the competitiveness of high-tech companies is largely dependent on innovative capacity while start-ups are key to the growth of jobs and innovation and so require specific support. The university is increasingly in demand and the interaction between knowledge workers in industry and the university is becoming more significant, as the knowledge workers scheme of 2009 has revealed.

A major prerequisite for a successful role of the university is excellence: with a growing globalization taking place, only a top international university will interest industry and international top scientists and academics.

So TU/e will drive on in the next few years along the path of valorization. The focus on the grand challenges Energy, Health and Smart Mobility, participation in European programs (FP7, EIT KIC InnoEnergy and KIC ICT labs) and the possibilities of the TU/e Science Park together with the position in the high-tech region of the Netherlands provide an excellent basis for this new phase to begin.

Intended results

• TU/e Research facilities roadmap at the start of 2013.
• Make cleanroom accessible to companies and research organizations.
• Regional approach for facilities with European allure.
**Innovative students**
The most direct form of valorization is the education of innovative students. In the coming years the activities and support of (enterprising) students will be extended with a special business incubator for students, entrepreneurship study modules and a separate private company in which students can get a paid part-time job next to their studies and teams can undertake assigned orders from companies and research groups. For students this is a great chance to combine study and earn on the side, and to build up a network within a large number of companies.

**Start-ups**
A second focus concerns start-ups. The intrinsic and organizational support of spin-offs is often the most effective way of generating research-based innovation, of developing prototypes of new products and getting them to market. A key role in the valorization approach by TU/e will be fulfilled by BrightMove, the valorization consortium of TU/e, Fontys, the Brabant Development Agency BOM and Brainport founded at the beginning of 2012.

This consortium supports the important initial phase of the life of spin-offs. Innovative start-ups in particular need this supervision in the first years to sustain success. TU/e thus aims to get more than 20 start-ups off the ground by 2020, co-owned by the university. The aim is that ‘exits’, the sale of the TU/e share in these companies, will in time create a revolving source of funding to support new start-ups.

Innovation is a product of cooperation par excellence. ‘Open innovation’ is at the basis of the success of many companies in the Brainport region. In recent years there have been many successful public-private initiatives like Point-One (high-tech systems), CTMM and BMM (medical), HTAS (automotive) and DPI (polymers).

**Consortiums**
Of course the emphasis of the valorization approach also lies on participating in meaningful consortiums and bilateral partnerships, including those from the EU Horizon 2020 program, the top sectors and the current and new EIT KIC’s. TU/e thus aims less for project-based relationships with industry and more for structural cooperation at corporate level, with partnership involving all areas of the university: education, research and valorization & innovation.

To further support cooperation with large and small companies a ‘Knowledge Transfer BV’ (private company) will be established and staffed mainly by principle research engineers who will work both within the university research groups and industry research teams to facilitate solid practical knowledge exchange between companies. Project-based cooperative partnerships will also be started in order to minimize the financial risks in the development of new products, services, processes and business creation.

**TU/e Science Park**
A fourth line in the valorization strategy concerns the development of the TU/e Science Park that will accommodate the university, research institutes, polytechnics and companies. The new Catalyst starter laboratory will be an incubator for young knowledge workers and new business, especially in the area of chemistry, physics, biomedical technology, electrical engineering, mechanical engineering, industrial engineering and mathematics. TU/e is also committed to developing living labs, with the campus and its buildings themselves acting as a test bed for technologies.
Work of people
Valorization is the work of people, with the professors and research groups central. They are responsible for the education, do research, have contacts with industry and the creativity needed for innovation. For all the valorization activities they are supported by the TU/e Innovation Lab, which has substantial experience of this spanning many years. The focus of the support lies mainly on acquiring projects in, for instance, Horizon 2020, project management, networking in the region and organizing events. The Strategic Areas, as the social face of TU/e, form a natural basis for intensifying and providing extensive support for valorization activities. The results of research and cooperation are at the heart of innovation and valorization: to acquire and share knowledge, patent and license commercial potential, and get it to market via spin-offs and companies.

Intended results

- TU/e will produce 10 spin-off companies per year.
- TU/e will grant 10 licenses per year on the basis of its portfolio of patents.
- The share of co-publications with industry researchers will be higher than 15%.
- Up till 2016 at least 5 living labs will be sited at the TU/e Science Park.
“The global competitiveness of TU/e benefits from collaboration and cooperation.”

“TU/e encourages the location of and cooperation with and between higher educational institutions, research institutes and (new) high-tech enterprises on its campus. The campus will become a TU/e Science Park of national importance and international allure.”

“Compared to the other Dutch universities TU/e wants to lead the way in the field of internal ICT services.”

TU/e Strategic Plan 2020

6. University and Campus
To support the core processes of the university, TU/e has opted for a strong focus on a number of ‘central threads’ in the policy: academic cooperation, TU/e Science Park, Sustainability and the Digital University. Each of these projects will contribute significantly to the university’s national and international profile towards 2016 and 2020. These projects also demand the effort of almost everyone at TU/e, whether researcher, student or auxiliary: everyone is affected and everyone can contribute.

6.1 Academic cooperation

TU/e carries out its research and education in a global playing field. New initiatives like the Bachelor College and the Graduate School aim to appeal not only to the Brainport region or the Netherlands but have also been developed from this global perspective. Clustering strengths and collaboration with other leading (technology) universities at home and abroad is necessary to strengthen our own international position and to provide our region with top quality labor and pioneering inventions. So building, consolidating and intensifying partnerships at home and abroad remain on the agenda.

Cooperation with the Netherlands

In the cooperation with Dutch universities the emphasis lies on clustering strengths and collaboration in both education and research, in order to increase options offered to students and boost international competitiveness. In cooperating with foreign institutions the focus is on developing joint research and study programs, staff exchange and exerting influence on the European innovation and research initiatives. The basis for both national and international cooperation lies with the researchers: at the level of research groups and individual researchers TU/e works with many universities around the world to produce joint research projects, publications and student exchange programs.

UU and UMCU

One of the main objectives for the coming years is to intensify the strategic alliance between TU/e, the University of Utrecht and the University Medical Center Utrecht. Within this preferred partnership ongoing projects concern the areas of Energy and Health. The aim of this cooperation is to use the complementary qualities and expertise of the partners to generate a substantial strengthening of education, research and knowledge valorization. Concrete cooperation projects give the partners more access to each other’s science parks and to the technology and application of science as well as fundamental research, clinical research and patient care. The partners invest in joint research projects and offer students access to each other’s studies. Joint Master study programs and/or tracks are being developed. The cooperation is further substantiated by the dual appointments of professors and talented staff.
3TU.Federation
Within the 3TU.Federation TU/e is committed to achieving the actions, goals and targets set out in the 3TU.Sectorplan Technology up till 2015, with a focus on improving the graduation rates and strengthening mathematics studies. In addition, the 3TU’s will push on with the further development of the Centers of Expertise, as in recent initiatives like 3TU.Bouw, Ethics and AMI (mathematics).

Nijmegen and Maastricht
TU/e is involved in other important cooperation initiatives, like the Center of Excellence with Radboud University Nijmegen in the field of organic chemistry, joint efforts with the University of Maastricht in the field of biomedical sciences and with Tilburg University in the area of entrepreneurship.

International cooperation

EuroTech Universities
Along with the Technische Universität München (TUM) and Danmarks Tekniske Universitet (DTU), TU/e initiated the EuroTech Universities partnership 2010, an alliance that has since been extended with the École Polytechnique Fédérale de Lausanne (EPFL). Within this alliance TU/e will help to find technological solutions to current societal problems (specifically energy, climate and mobility). To be able to closely monitor and influence European developments the partners will have an office in Brussels. The CLUSTER and CESAER networks will also be important from a European cooperation perspective.

Bilateral partnerships
TU/e is also involved in different bilateral partnerships with other science & technology universities around the world, like the Chinese university of Zeijiang. TU/e strives to increase the number of bilateral partnerships in the future to boost its profiling and positioning.

To this end TU/e is looking particularly at a select number of target countries according to specific criteria like a rising GNP, significant demand for (international) higher education, an incentive program for internationalization, the presence of science & technology universities and a growing high-tech and innovative industry. Criteria have also been developed for selecting individual institutions for the development of strategic partnerships in the coming years. TU/e will form consortiums with these universities to develop activities in the area of education, research and innovation.

Europe
Current participation in a range of EU Framework program projects, five Erasmus Mundus initiatives and two of the three Knowledge and Innovation Communities of the European Institute for Innovation and Technology is an excellent basis for also building international consortiums in the new European ‘Erasmus for all’ and ‘Horizon 2020’ programs.

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Intended results

- Successful execution of cooperation projects with the University of Utrecht and UMC Utrecht in the fields of research, research facilities, business development, mutual education and jointly developed Master studies/tracks.
- Successful embedding of 3TU.Centers of Expertise and starting new initiatives.
- 5 new international partnerships in progress, each with a cooperation program (in development) in the areas of education, research and valorization.
- Optimization of participation in the ‘Erasmus for All’ and ‘Horizon2020’ programs.

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6.2 Development of TU/e Science Park

TU/e is focused on the future and has international ambitions in the area of education and research with corresponding modern study facilities and laboratories as well as suitable accommodation for departments and services. In collaboration with the High Tech Campus (Eindhoven) and the High Tech Automotive Campus (Helmond) TU/e is investing strongly in the development of its campus into a Science Park of national importance and international allure.

Cluster of technology studies

The TU/e Science Park will develop in the coming years into a cluster of technology studies from intermediate and higher vocational to academic level, with the ROC Eindhoven and Fontys Eindhoven engineering studies also having a place on the campus. Innovative companies will also have specially devoted part of the TU/e campus reserved for them. TU/e itself will be concentrated around the Green Strip. The clustering of studies enables students to use the different levels of studies and will strengthen the mutual ties between the institutions.
Meeting place
TU/e wants to offer its students and staff not only modern education and research facilities but in the TU/e Science Park also an attractive place to work, learn and live, where students, scientists and academics from every discipline and from every country can mix and meet informally. Cultural activities and extensive sports facilities are part and parcel of an academic community. The campus buildings will therefore be open in the evenings for study, work or relaxation.

Innovative business
The location of innovative companies will give the TU/e Science Park a place where students, science and business can meet and where facilities, like laboratories, can be used by both the university and industry alike. The current and future location of TNO institutes, like FOM-DIFFER, will be equally important in this respect. Moreover, TU/e wants to give its graduates attractive possibilities to start up their own companies on the university grounds.

Green and sustainable
In the new design of the campus grounds TU/e will strengthen the green, sustainable character of its campus. The large-scale redevelopment and renovation along with the realization of the Green Strip make this an emphatic starting point. The TU/e Science Park will mainly be a campus in development in the next few years as TU/e makes a huge investment in four massive extension, renovation and new building projects major as well as many smaller-scale projects.

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**Intended results**

- Realization of state-of-the-art accommodation and facilities with an attractive allure for education and research.
- The different projects will be realized in line with the Accommodation Master Plan.
- Strong clustering of technological studies (TU/e, Fontys, ROC) at the TU/e Science Park.

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**6.3 Sustainability**

Sustainability has an important place in the education and research of TU/e, with many research projects, also with industry, geared to sustainable applications. As engineers of tomorrow students realize that the future must be sustainable. This means generating and using renewable energy, reusing raw materials and products to close the cycle and deploying smart, sustainable mobility. TU/e wants to be an (inter)national beacon of sustainable innovation not only by prominently incorporating these issues in education, research and knowledge valorization but also by applying them at the TU/e Science Park and in its own organization. An initial milestone to this will be when the TU/e campus becomes climate-neutral in 2015.
**Education - research – knowledge valorization - campus**

Under the header ‘City of Tomorrow’ TU/e recently explored lines of action for the sustainability agenda that is being drawn up and that will be shaped in the next few years. A central ingredient is the interaction between education, research, knowledge valorization and the campus: the university both as education and research institute and as organization and company will take up the challenge. In a word, the engineer of tomorrow will have the campus as his living lab.

Many themes and topics with a focus on a sustainable future will appear in the education and research such as sustainable mobility, building, energy and innovation. The first job is to profile these activities clearly, looking at the possibility to develop within the Bachelor studies a coherent package geared to sustainability and which is completed with a degree. A subsequent step is to link the education, research, knowledge valorization in projects that are developed by students and researchers in the context of living labs at the TU/e Science Park.

**50% energy-neutral in 2030**

The third step is the aim to make the TU/e campus 50% energy-neutral by 2030: the TU/e will generate half of its own energy in a sustainable way. The university will thus opt for an innovative approach: the campus will be designed as a living lab in which students, researchers and companies will test out and develop innovative products, concepts and ideas. The living lab approach makes TU/e more sustainable, shortens the time-to-market of sustainable innovations and gives students, companies and residents a key role.

These three steps will be the central thread in a coherent sustainability agenda that TU/e will develop in 2012 and will subsequently be detailed in roadmaps and related concrete projects. In the sustainability agenda the Strategic Areas, Bachelor education, the development of the Science Park, the communication policy and efforts in the context of the Brainport 2020 strategy will, of course, play a key role.

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**Intended results**

- Sustainability agenda ready in 2012
- TU/e campus climate-neutral in 2015 and 50% energy-neutral in 2030
- TU/e wins the Dutch Sustainability Award for transparency about sustainability.
- Projects coherent with the Bachelor College, Graduate School, Strategic Areas and Campus 2020 implemented in 2016, including at least five living labs.
6.4 Digital University

TU/e has excellent and internationally attractive ICT facilities, infrastructure and services for research and education. In the coming years, too, TU/e will invest in the integration of ICT in daily research and education. A vision and approach are currently being developed for this. Ambitions are already high: future generations of students will accept nothing less than ‘anytime, anywhere and with any device’ contact with organizations and each other.

Education

The intensification of the role of ICT is naturally focused on strengthening educational effectiveness and efficiency. TU/e is geared to developing educationally based ICT applications that target the activation of students, giving (peer) feedback, diagnostic and adaptive testing and supporting individual and group learning processes in self-study. These applications will be integrated in the digital learning and work environment of the university, OASE.

This gives the student greater flexibility and enhances graduation rates as well as offers opportunities to distinguish the range of studies on the basis of the wishes of individual students by making extra content accessible.

Networking with high schools

In developing the ‘digital university’ TU/e will explore the extent to which digital networks strengthen the link between secondary education and the university. The focus will be on preparing high-school pupils for an academic science and technology study and also strengthen intrinsic collaboration between the university and high schools via the Pre-University College. This helps students to choose more frequently a suitable study.

In the same way the extent to which a study programs at a different institution can be digitally supported and how students from other institutions can make use of the studies at TU/e will be explored.

Research

In addition to effectiveness, efficiency, flexibility and differentiation in education, the emphasis of the ‘digital university’ will lie on developing new possibilities for research. A well-known, significant and key development is the digitization of the library. In the development of the digital university vision also the use of the TU/e Science Park as a living lab will be explored, for example for health research whereby digital data on a substantial population are generated or experimental testing of new communication concepts and applications is performed.

The ICT infrastructure and hardware have always been important for research. So the centralized accommodation and management of sizable computer systems and safeguarding superfast connections with systems and institutions have to be a given. Open Access of research publications will also be effected via the library and the 3TU datacenter.

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Intended results

• Vision and implementation plan ‘Digital University’ ready mid 2013.
7. Preconditions

Administrative embedding of projects
The Strategic Plan 2020 states: “To be able to implement the Strategic Plan properly a coherent strategic program will be set up under the direct orchestration of the Executive Board. For each initiative a project will be defined and a project leader appointed”. The projects have since been defined and project leaders designated. The institutional plan provides a preview of the ongoing projects in the strategic projects program over a four year period. The administrative agenda employed by the Executive Board details this for a period of one year, and progress is monitored via quarterly reports. TU/e has chosen this structure to support the long-term development and to be flexible in response to new developments.

Financing
The implementation of the strategy requires substantial long-term funding and investment. In total the amount is some 600-700 million euros, 450 million of which is for the accommodation of the university and the development of the TU/e Science Park and 150-200 million euros for the other strategic initiatives. Upon the launch of the Strategic Plan it was indicated that TU/e is able to provide up to half of the total funds needed with the other half having to come from investments, participations, external contributions and subsidies.

Since the launch of the Strategic Plan TU/e has been confronted with new budgetary constraints from the Dutch and European governments. Key elements here are the strategic agenda of the Minister of OCW, the Top Sectors policy of the Minister of EL&I and the European Horizon 2020 program that clusters the research and innovation programs of the EU. The result of these initiatives is that the basic funding is under further pressure and that funds will have to be acquired more on the basis of competition. In this perspective TU/e already began cutbacks in 2011. The university will also have to enter into more direct financial relationships with industry where R&D cooperation had previously been stimulated by national natural gas profits (FES) and innovation subsidies from the government.

These developments mean that the budgetary constraints for implementing the Strategic Plan have become more constricting and that a “new for old” approach is needed even more than has already been applied. Furthermore, the university will have to brutally roll up its sleeves to acquire sufficient external funds, with a strong focus on the Dutch top sectors and on the European Horizon 2020 program.
The different parties in the high-tech Brainport region Southeast Netherlands, government, industry and research are all aware of the impact of the new budgetary frameworks. Close ties with these organizations make it possible to tackle these effects and challenges together. TU/e will therefore enter into dialog with these partners to discuss how to optimally use available financial sources and how to optimize mutual cooperation.

**Personnel and organization**

In terms of personnel and organization the preconditions and challenges remain unaltered in principle. The adage ‘organization follows strategy’ means that TU/e will not be pushing through any significant organizational changes in the next few years. As for personnel policy there were and still are considerable challenges in respect of attracting and retaining science academic talent, the share of female researchers at TU/e and boosting the proportion of foreign science academic staff. The projects referred to in this institutional plan illustrate these challenges well.

The efficiency of the internal organization is also an important item. In recent years much attention has focused on the efficient support of the processes of education, research and knowledge valorization. This has led to a relatively low overhead for TU/e of 15.4%. This approach will be continued in the years ahead. Every year two support services will be benchmarked in terms of quality and effectiveness while the educational administration and the educational support will be streamlined and centralized. TU/e also targets more educational productivity and efficiency through the use of ICT resources.

**Communication**

Well orchestrated communication is essential to achieving the results of the different projects. In the next few years the emphasis will lie on the Strategic Areas, the Bachelor College, the Graduate School and TU/e press policy.

Communication on the Strategic Areas aims to boost awareness among the general public and prospective students, to strengthen internal involvement and support the internal and external Strategic Area networks.

As for the Bachelor College, there will be a focus on changing the image of education at TU/e and clear positioning of the TU/e Bachelor College. There will be an emphasis on the challenging Bachelor studies provided by TU/e for every type of science student and the conscious choice to provide education for different kinds of engineers of the future, not just engineering specialists but also application-oriented and broad-based engineers.

Communication activities concerning the Graduate School focus on strengthening international visibility, increasing the intake in the Master and Designer study programs, and reinforcing the international character of TU/e.
## Quantitative goals of the Institutional plan 2013-2016

*(2016 goal per 31 December)*

<table>
<thead>
<tr>
<th>Category</th>
<th>2011</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake in Masters in the Energy area</td>
<td>70</td>
<td>105</td>
</tr>
<tr>
<td>Level of external funding of research in the Energy area</td>
<td>€15 m</td>
<td>€15 m</td>
</tr>
<tr>
<td>Number of partners in Smart Energy Regions network</td>
<td>n/a</td>
<td>150</td>
</tr>
<tr>
<td>Intake in Masters in the Health area</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>Level of external funding of research in the Health area</td>
<td>€13 m</td>
<td>€13 m</td>
</tr>
<tr>
<td>Intake in Masters in the Smart Mobility area</td>
<td>110</td>
<td>165</td>
</tr>
<tr>
<td>Level of external funding of research in the Smart Mobility area</td>
<td>€9 m</td>
<td>€9 m</td>
</tr>
<tr>
<td>Intake in Bachelor study programs</td>
<td>1190</td>
<td>1540</td>
</tr>
<tr>
<td>Graduation rate of Bachelor study program re-enrollers (source 1 cijfer HO)</td>
<td>41%</td>
<td>≥ 55%</td>
</tr>
<tr>
<td>Participation in Honors programs (Bachelor)</td>
<td>4%</td>
<td>≥ 10%</td>
</tr>
<tr>
<td>Intake in Master study programs</td>
<td>1100</td>
<td>1375</td>
</tr>
<tr>
<td>Intake in PDEng studies</td>
<td>120</td>
<td>140</td>
</tr>
<tr>
<td>Intake in PhD programs</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>Master graduation rate within 30 months</td>
<td>50%</td>
<td>60%</td>
</tr>
<tr>
<td>Share of lecturers with BKO</td>
<td>12.5%</td>
<td>20%</td>
</tr>
<tr>
<td>Number of participants in postgraduate education (excl. TiasNimbabs)</td>
<td>n/a</td>
<td>250</td>
</tr>
<tr>
<td>Number of international students in Master study programs</td>
<td>560</td>
<td>620</td>
</tr>
<tr>
<td>TU/e students with foreign experience</td>
<td>19%</td>
<td>25%</td>
</tr>
<tr>
<td>Number of ongoing High Potential Research Programs</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Number of WISE Tenure Tracks per year</td>
<td>3</td>
<td>≥ 3</td>
</tr>
<tr>
<td>Number of TU/e spin-offs</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>New licenses granted by TU/e</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Co-publications with industry</td>
<td>15.3%</td>
<td>≥ 15%</td>
</tr>
<tr>
<td>Number of living labs realized at the TU/e Science Park</td>
<td>n/a</td>
<td>≥ 5</td>
</tr>
<tr>
<td>Number of new international partnerships in progress</td>
<td>n/a</td>
<td>≤ 5</td>
</tr>
</tbody>
</table>
## Compulsory indicators in performance agreement proposal with the Secretary of State for OCW

*2015 goal per 31 December*

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2011</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality / excellence (share of full-time Bachelor students in Sirius-certified honors tracks in respective cohort, source OWIS)</td>
<td>-</td>
<td>≥ 7%</td>
</tr>
<tr>
<td>Quality / excellence (students satisfied / very satisfied, source NSE)</td>
<td>85.2%</td>
<td>≥ 85%</td>
</tr>
<tr>
<td>First year dropout (source 1 cijfer HO)</td>
<td>23%</td>
<td>≤ 20%</td>
</tr>
<tr>
<td>First year switch (source 1 cijfer HO)</td>
<td>5%</td>
<td>≤ 7%</td>
</tr>
<tr>
<td>Graduation rate for Bachelor re-enrollers (source 1 cijfer HO)</td>
<td>41%</td>
<td>≥ 55%</td>
</tr>
<tr>
<td>Lecturer quality (share with BKO, source WOPI)</td>
<td>12.5%</td>
<td>≥ 25%</td>
</tr>
<tr>
<td>Study intensity (less than 12 contact hours, source OER and timetable)</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Study intensity (number of contact hours per week, source OER and timetable)</td>
<td>12-32</td>
<td>12-24</td>
</tr>
<tr>
<td>Indirect costs (fte indirect / fte total, source Berenschot)</td>
<td>15.4%</td>
<td>≤ 16%</td>
</tr>
</tbody>
</table>

## List of chief indicators 3TU Sector Plan 2011-2015

*2015 goal per 31 December*

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2011</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of credits gained per student per year</td>
<td>32.6*</td>
<td>50</td>
</tr>
<tr>
<td>Maximum study dropout in the second and third years of the Bachelor study</td>
<td>16%*</td>
<td>10%</td>
</tr>
<tr>
<td>Number of first-year Bachelor students</td>
<td>1190</td>
<td>1400</td>
</tr>
<tr>
<td>Number of first-year Master students</td>
<td>420</td>
<td>525</td>
</tr>
<tr>
<td>Number of intakes in the designer programs</td>
<td>120</td>
<td>140</td>
</tr>
<tr>
<td>Extra mathematics capacity achieved</td>
<td>0*</td>
<td>1.1</td>
</tr>
<tr>
<td>Number of extra mathematics modules available online</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

*relates to figures for 2010*
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