Challenges of university-business cooperation

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Delft University of Technology generates between 15 to 20 per cent of the total income from contract work with the private sector which is above average on the European continent. This paper describes the different ways of Delft University to work with the corporate sector such as contractual research and working in consortia. It then pictures how it makes use of its extensive on-campus research facilities for partners from industry, and shows a range of services that are offered to third parties. The article concludes with a glance at success factors and pitfalls in working with the corporate sector.

1 Introduction

When Delft University of Technology was established by King Willem II, it was as a "Royal Academy for the education of civilian engineers, for serving both nation and industry, and of apprentices for trade". The latter suggest that Delft University has strong ties with corporate world from the early days of its existence, and indeed it has. Traditional links with the corporate sector exist on many levels and over all of its eight different faculties.

Delft University of Technology is the Benelux' biggest technical university and together with Imperial College, ParisTech, Aachen and ETH Zürich it forms the so-called IDEA league. No less than 5 out of 8 deans of this university have worked in the corporate sector before joining the university, which demonstrates its unique knowledge of the corporate world and the strong ties it has with companies.

Diversifying income is about more than working with the corporate sector. Currently 4.5 per cent of Europe's university funds come from philanthropy. A good example of this are the Nanoscience activities of Harvard, Delft, Cornell and Caltech, which have been recognized by the Kavli Foundation as being at the frontiers of nanoscience, and grants are received in order to "to seek answers to the most fundamental questions". The Kavli Institute of Nanoscience at the department of Nanoscience in Delft is the only Kavli Institute for Nanoscience outside of the US.

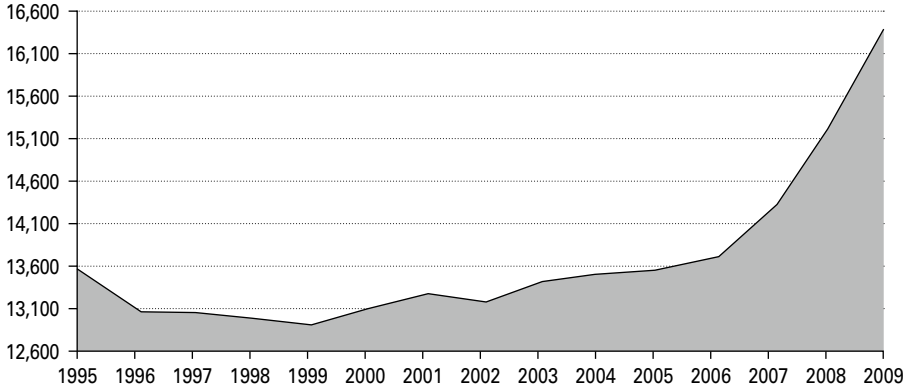
In general terms there are several ways to diversify income streams among which philanthropy (as above), student contributions, international public funding and funding

from working with the corporate sector. All diversification types are explored at Delft University of Technology. This is the focus of the next part of this article.

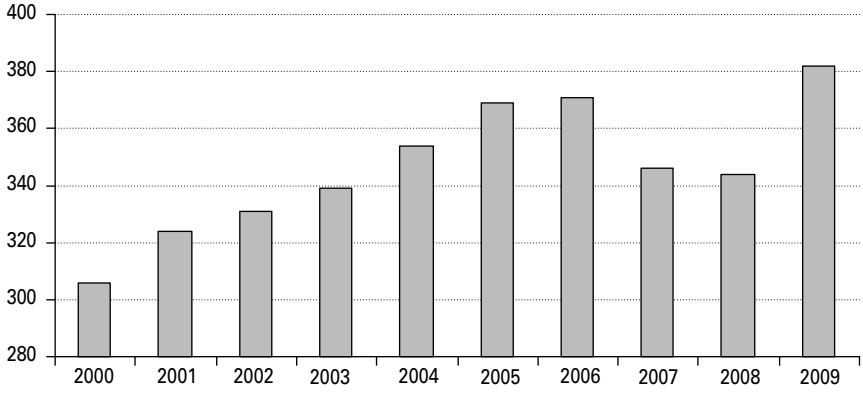
The need for diversification of income streams

Over the last couple of years student numbers at the University have risen dramatically as can be observed in graph 1. At the same time public funding has stalled (graph 2), a common issue across European universities, but especially eminent in Delft. Clearly this situation requires an active strategy towards diversifying income streams and, although currently around a quarter of the university's income is coming from other streams than from direct public funding, this might need to grow further. Graph 3 demonstrates that the level of income from contract work has already risen strongly in recent years.

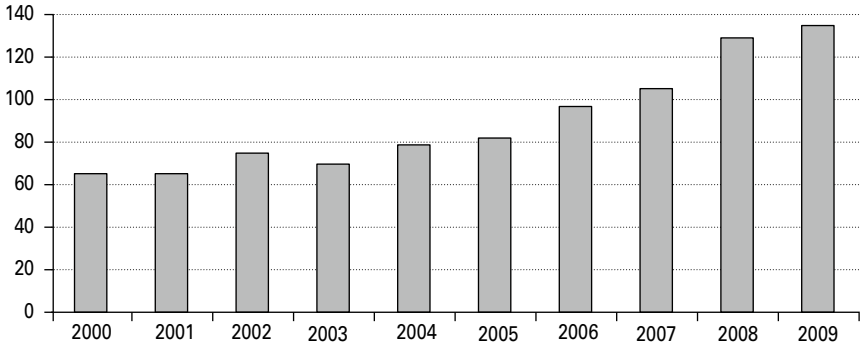
Graph 1: Strong increase in student numbers



Graph 2: Public income stream flattens



Graph 3: Increasing income from contracting work



The average income generated from contract work with the private sector for European universities ranges from 5 to 7 per cent of the total income structure. For Delft University of Technology, this figure is between 15 and 20 per cent, which by US or UK standards might seem modest, but is significantly above average on the European continent. There exist different ways to work with the corporate sector, many of which Delft Technical University has experience with. The following chapters focus on possibilities for cooperation.

2 Contractual research with the corporate sector

2.1 Strategic partnerships and contractual research

Strategic partnerships with the university are meant to be intensive partnerships over the long term. They usually spin out of short-term contractual research, after which the university, in these partnerships, combines knowledge from more diverse fields of research and aligns those with specific areas of interest of the partner company. The university then enters into a "master agreement" for several years, clearly setting out the exact areas of cooperation.

Contractual research is a possibility that caters to the need for specific technical research solutions; it is sometimes introduced to help bring a new product idea to life or to mobilise one or more of the university's 2700 scientists in one of the 160 research groups. A common option is having students available for contract work. Students are deployed via internships and graduations at different stages of their studies for periods from of a couple of weeks up to one year to work on a specific assignment as described by the corporate partner.

A very effective way of working with students is by means of project education. In this manner the university offers businesses the opportunity to participate in specific

education projects on for example product design. As a result of this set-up, businesses get access to ideas and designs of students working on assignments within their curriculum. Shape and substance of contractual research come in all sizes dependent on the complexity of the problem.

Process wise, when embarking on a contractual research project, the university will identify the right person which will be best able to meet the partner's needs. A written agreement is then drafted by the university's contract manager which describes the specific research arrangements. This also contains arrangements on how project results can be put to work after the research is finished. When required, it will also deal with issues of intellectual property, interim reporting methods and evaluation. Costs for contractual research depend strongly on such matters as duration, complexity, required equipment and materials. Doing so, the university is moving more and more towards a full-costing basis.

Below are three examples that demonstrate the versatility of the partnerships that the university has been setting up.

Developing haptic feed back with Nissan

To develop an in-built speed control technology for vehicles, Nissan found a valuable partner in Delft University of Technology. A combination was put to work out of the knowledge of mechanical functioning of the human body, man-machine interaction and real-time simulation.

The university is now building on this project by developing new applications for this technology. Actively sharing ideas with Nissan has given the university lots of scope for follow-up research. Applications for this jointly developed technology are already in use in Japan.

The Axe Bow for Damen Shipyards Group

Another example where contractual research has spun off a variety of interesting results is the so called Axe Bow concept, with which a ship can maintain high speeds in strong winds and heavy seas. This solutions answers to a long standing wish of ship builders of patrol and supply vessels. Damen Shipyards, the biggest shipbuilders in the Netherlands, built several ships based on this concept and now holds an exclusive license to the patent. The clause that makes this agreement especially interesting is that part of the commercial revenue goes into an exclusive R&D fund. In this way the university created the possibility to further continue the push of technology from a more scientific curiosity approach.

Joining forces with Shell

Over the last four years the university has worked with Shell on their Sustainable Mobility Programme. Several scientists of the university and Shell have been collaborating on research projects ranging from fuel production using artificial photosynthesis to sustainable transport of dry bulk cargo.

Last year, Shell and Delft University of Technology entered into a strategic partnership to join forces to develop innovative technologies that could help increase the amount of oil and gas that can be extracted from subsurface reservoirs.

Staff from both Shell and Delft University of Technology, including several PhD students, are involved in a joint research programme, which will initially run for six years. The "Recovery Factory" project combines Shell's expertise with the strength of Delft University of Technology to significantly advance Shell's capability to enhance oil recovery through a combination of tools and techniques, some of which are new to the oil industry. In this project, different areas of science are combined such as mathematics, systems and control theory and geology. A clear example of how working with the corporate sector can build leverage at the forefront of technology.

2.2 Working in consortia

Other than working in strategic partnerships as described above, the university is combining strengths with several partners in different consortia and it is involved at national and European level in numerous consortia together with large corporations and other higher education institutions. Within the Sixth and Seventh Framework Programmes of the EU (FP6 & FP7), the university takes part in more than 200 research projects, partnering all over the EU. These consortia are not necessarily with large partners only, but can very effectively be built with small and medium enterprises (SMEs). Examples of those in which Delft University of Technology is involved are many. Two of these include MicroNed and Greenport Campus.

MicroNed is a national consortium of researchers and entrepreneurs in the field of microsystem technology with about 250 researchers from a broad range of disciplines and active in 9 knowledge institutes and 23 businesses, including 18 SMEs. Greenport Campus, which has been established to stimulate innovation in the Dutch horticultural sector, has been set up for technical suppliers of the horticultural sector and their customers.

On a larger scale, the university is part of Knowledge and Innovation Communities (KICs) related to ICT and climate change. These are initiatives through which the Eu-

ropean Institute of Innovation and Technology will provide a powerful stimulus to research and innovation throughout Europe.

3 Maximising the use of facilities

Technical universities have a wide range of testing facilities at their disposal, Delft University being no exception. In practice some facilities are generating income more actively than others, but they all have huge potential in common. Arguing the other way around, the university should also look for what partners from industry can offer in terms of equipment and facilities. This can result in rationalizing the use of facilities, freeing up resources and deploying them differently.

Delft University of Technology has extensive on-campus research facilities, ranging from wind tunnels, chip facilities, a flight simulator, a high-voltage lab and a nuclear reactor. On the "softer" side it holds "serious gaming" and product evaluation facilities which are popular with companies. Dozens of instruments for measuring and testing are 'advertised' for use. Many of these are unique in the Netherlands and available for corporate research. A couple of examples are listed hereunder.

- *Chip* facility: the facility Dimes is a research school dedicated to promoting research and education in microsystems and nano-electronics. State-of-the art lab facilities, technology development, devices, circuits and systems are open to third parties.
- *Radar* facilities: several radar installations are available among which a transportable radar system for atmospheric measurements and a radar for the measurements of clouds and precipitation in order to better understand climate change.
- *The Reactor Institute* Delft: this institute is a 2 MW research reactor with unique measuring instruments and radiation facilities. It produces radio isotopes for application in many different fields and provides accredited activation analysis for the accurate measurement of element concentrations. A new function is the ability to produce medical isotopes for human treatment in case of shortage from other sources.

4 Delivering services

The University also offers a range of services, in line with its expertise and activities, which are available to third parties as illustrated below.

Brainstorming and team support

A Group Decision Room with electronic meeting support systems is for hire and all sorts of software to support collaborative company processes. These are used for

strategy building, crisis management, project evaluation, risk assessment and planning. So called "serious gaming techniques" have been developed to support this.

In-company training

The university is very active to share its knowledge to society in a broader sense. This is seen as a public task and does not generate income. What does however, is the offering of our School of Executive Education, Delft TopTech. Via this institute, Master education and management training is offered in fields such as reputation, ecology, energy, ICT, space, telecoms, transport, safety and security. Through these courses, company management is brought up to speed on the latest developments in these areas.

Literature surveys and patent research

The university offers literature survey and patent research to help clients with their first steps of research or preparations for a patent application. The university's Library has several information specialists who are carrying out literature surveys tailored to clients needs.

5 Creating future partners

Diversifying income streams in the different ways described above is one aspect, but looking ahead and investing in building a proprietary corporate network is another, longer-term approach to income diversification. By facilitating student start-ups, the university not only invests in the future of its students and society, but also in future partner companies.

Starting up one's own business, for those who want to, is encouraged strongly at Delft University of Technology. Not only do several courses prepare for business, but students who want to start their own business during or after their studies are supported by an incubation centre. Over the last years this centre has guided some 70 start-ups. All of these companies, when fully grown, can become partners of the university in a way or another. To financially support specific initiatives, the university has decided to establish a financial vehicle in the form of a venture capital fund. This is done together with, amongst others, a commercial bank. Currently, this support is available for sustainable developments in food, agriculture and energy.

A few examples of business emerging from the university are detailed below:

- *The Senz umbrella*: born out of pure frustration from a student with traditional umbrellas that easily break broke down, this product won almost all major design awards in the world including the prestigious red dot design award. The business is now active in Western Europe, North America and Asia.
- *Foldable containers*: students at Delft University of Technology have succeeded in developing a simple, sturdy, affordable folding system for shipping containers. Under a pilot scheme (and warded a number of prizes for innovation) hundred of these containers are to be shipped from Rotterdam to Asia.

6 Success factors and pitfalls in working with the corporate sector

Diversification by working with the corporate sector is beneficial not only from a financial perspective. It increases the embeddedness of the institution in the corporate world and therefore in society at large. It also gives students early exposure to businesses and it increases companies 'understanding of curricula and current research.

When developing stronger links with companies however, there are a couple of issues to keep in mind. A clear and transparent relationship management model is required to avoid too many researchers and students run after the same contact in a company. A Client Relationship Management system helps, but will only work when used and updated regularly. Before embarking into university-business relationships it is a must to make an active effort to understand the real current situation and needs of the company, also beyond innovation and research issues.

Potential pitfalls occur when groups in the university seek to seize every opportunity without relating it to their their own strategy and priorities. High level agendas and roadmaps must offer guidance and help determine which opportunities should be explored by the university. If not, the danger exists of the university becoming too much of "just another" research institution, with fundamental and curiosity-driven research too far off the radar. Too much eagerness for external funds may distract from the institution's mission and focus. Another obvious threat is to become too dependent from external budgets, losing control over the university's agenda and creating vulnerability when these income sources dry up. This might sound like a luxury problem, but once the dependence to external and agenda-setting funds has become too big, it might not be all that easy to reverse.

Public Relations may constitute another challenge. Universities need to realise that practical issues may occur in this area, in case the independence of research is questioned. Will the public always understand how scientists may wear different hats?

When talking to media, will it be understood that a researcher can be perfectly objective to a certain case in which his partner is involved from which he also receives funding? These are challenges to look out for. Whatever the institutions does, it should understand its own brand values and always steer to remain close to them.

Working with the corporate sector is a great means to diversify funds, but also helps to make what universities do more relevant and what companies do more competitive. Both will benefit from each other's strengths and brands and therefore become more embedded in society itself.

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Mark Lammerts obtained an MSc in Space Geodesy at Delft University of Technology in 1988. He worked in Marketing & Communication roles in different sectors in the industry, firstly with Toshiba and later with Royal Dutch Shell, where he was responsible for their credit card business. He moved to the investment management industry in 1997, where he was Senior Vice President and Global Head of Marketing & Communications with ABN AMRO's investment management business. After over 20 years in the industry, in early 2009, he transferred to his Alma mater, to become Director of Marketing & Communications.