Bilag 7

The IT University of Copenhagen

Strategy 2009-2011

1 Introduction

This document is a simplified and updated version of the document "Strategy of the IT University of Copenhagen (ITU) 2006-2010" clarifying what the university is currently working with. It was approved by the Board of Directors on 17 April 2009.

The document has been drawn up by the management as a result of an open, continuous process involving the entire ITU organisation. It complies with the Danish Act on Universities, the ITU development contract – which is reviewed yearly by the Ministry of Science, Technology and Innovation – and the vision of the Global ITU (separate document).

The IT University of Copenhagen in Denmark is a state-funded University, dedicated to teaching and research in Information Technology. The IT University of Copenhagen is situated between DR and Copenhagen University in Ørestad, a new district in Copenhagen.
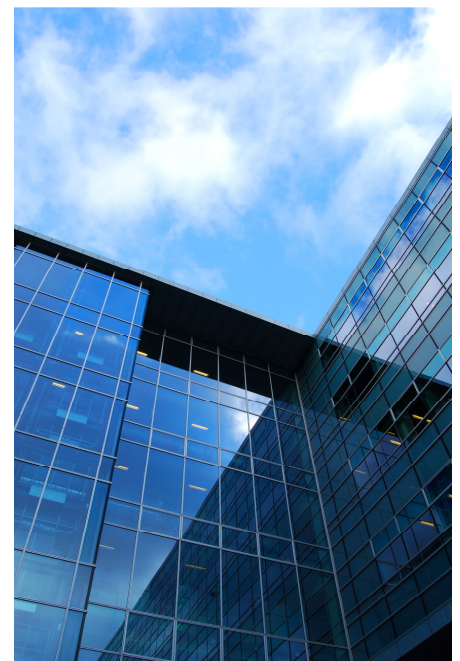
2 Summary

The IT University is based on three basic principles, which facilitate critically important innovation. The three principles describe the IT University´s view of what Information Technology is; how the university sees an ideal study programme; and the expectations to the motivation of all researchers.

In our view, the power of Information Technology comes from the fact that Information Technology allows humans to handle mental constructions in ways that were not possible before the age of digital technology.

At the IT University, an ideal study programme is one that satisfies these three conditions:

1. It attracts a large number of well-qualified students, with an overrepresentation of excellent students;

2. The academic contents and the teaching are both world-class;

3. It gives the students the competences needed for the future job market.

All research is expected to be motivated by *both* the search for fundamental insight *and* consideration of use.

It is the vision of the IT University to become a "knowledge hub", through which students and researchers engage in global knowledge processes of exceptionally high quality.

Information Technology plays a crucial role in globalisation, and the ITU views education and research as processes that are candidates for globalisation. To pursue its goal of becoming a globally interactive university, the ITU intends to start a research initiative in 2009 – the Global Interactive Research Initiative (GIRI). The strategy consists of an interdisciplinary portfolio of five research strands, which together will form a strong research agenda for understanding and building global interaction. In creating value for the Copenhagen Region through teaching and research, the ITU wants to continue the increase in PhD-students, MSc students and bachelor students; to deliver competences which are sought-after in the Copenhagen Region; and increase the number of research papers.

It is our stated aim that by 2012 most study programmes at the ITU will have undergone changes as a result of experience gained through global pilot projects, and that the ITU will aim at establishing an online infrastructure to support students and researchers in global interaction.

The ITU finds it important to ensure the relevant competences in the staff (in terms of teaching, support, language etc). Finally, it is necessary to constantly improve the efficiency and cost effectiveness of key processes at the ITU.

3 Mission and Vision

The mission of the IT University of Copenhagen is to provide internationally leading teaching and research which will enable Denmark to become exceptionally good at creating value with IT.

Vision The IT University of Copenhagen is an outstanding example of how a small university can achieve a ranking among the best in the world, both in terms of academic standards and in terms of creating value, by being innovative and globally interactive.

Denmark is already among the foremost in the world in applying information technology (IT). However, to become exceptionally good at creating value with IT Denmark must also be able to develop new IT-technology and IT-services. This requires a large number of well educated and innovate graduates with IT-competencies at the highest level.

4 Strengths

The main strengths of the IT University of Copenhagen, as we perceive them, are:

- Documented success with novel study programmes; the creation of the IT University has resulted in a doubling of the number of IT graduates at MSc level in Denmark and the IT University has the most sought part-time study programmes of all Danish universities, within the Natural and Technical Sciences.

- The body of faculty, staff and students has high standards and forms an agile whole, which is able to overcome obstacles and develop in chosen strategic directions. The university has already influenced the perception of what IT is all about, nationally and internationally, and it continues to challenge frontiers, for example in its approach to globalisation.

In addition, the university enjoys a splendid building, attracts many international applicants for vacant positions, is well-funded and uses funds prudently.

5 Challenges

Creating value with IT requires a large number of university graduates at all levels ranging from diploma to PhD. For decades, the supply of IT graduates in Denmark (and many other highly-developed countries) has fallen short of demand. Although the IT-university has contributed to a sharp rise in the number of graduates in Denmark over the past 10 years, IT graduates are still in short supply. Therefore, attracting a high number of applicants to the IT University is a very important challenge.

Globalisation is a tremendous opportunity for Denmark in general and for the IT University in particular. At the same time, globalisation challenges the IT University. The challenge is to develop from an initially relatively Danish-minded university, whose impact was at first largely local, into a university which has a global mind-set and conducts its teaching and research in globally interactive processes.

PhD production in Denmark is only around 50 IT PhD's a year, which is well below demand and the level in other high-tech areas. The shortage of PhD's is a hindrance both to research-based collaboration with Danish private companies and public organisations and to the growth in Denmark.

The key to meeting the challenges is excellent employees, where by employees we mean faculty, staff and managers. Although the university has been able to attract many and highly qualified employees, many more will be needed in the coming years. The competition for excellent employees is fierce in Denmark. Hence, the recruitment of new employees, many of whom will not be Danish, and the development of the current employees are very important challenges.

The externally defined conditions (financial, political and academic) of the IT University are changing at a very rapid pace. At the same time, the university wants to break new ground and be proactive, rather than just react to changes. This is a delicate balance act, which requires a constant outlook for changes on the horizon and a very agile and well-functioning organisation. A challenge for the university is to ensure that

the daily operations of the university leave enough capacity to allow both for keeping up with changes and taking proactive initiatives that are unique to the university.

6 Core Focus Areas and Strategic Goals

6.1 Sustaining the Innovative Culture of the IT University

The IT University is based on three basic principles, which, when used in the daily life of the university, facilitate critically important innovation.

6.1.1 The IT University Triangle

At the IT University, we hold a particular view of what IT is.

> **IT University Principle # 1** The essence of Information Technology is the creation, sharing and handling of mental constructions using digital technology.

In our view, the power of Information Technology comes from the fact that Information Technology allows humans to handle mental constructions in ways that were not possible before the age of digital technology. In that sense, IT is as important a break-through for man-kind, as was the invention of reading and writing thousands of years ago.

As an academic field, Information Technology draws on

- Science, including Computer Science

- The Liberal Arts, including Communication and Design

- Business, including studies of both private and public enterprises.

A fundamental idea of the IT University is to attract students, faculty and external collaborators from all three fields and have them work together. The following triangle describes the study programmes at the IT University:
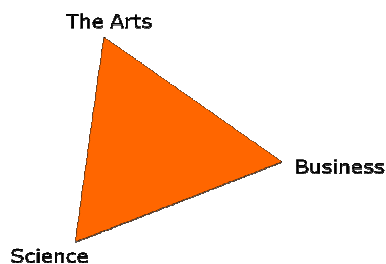
There is no expectation that every student and every member of faculty is to be strong in science *and* arts *and* business. The IT University is a place for people who are strong in science, arts *or* business AND want to work with people who approach IT from the other two angles.

Of the three angles, the Science and Arts angles are currently more prominent at the IT University, both in terms of number of students and number of faculty, than the Business corner. The IT University enjoys good collaboration with Copenhagen Business School (CBS) concerning the EBUSS M.Sc. programme. That collaboration is expected to continue. In addition, the IT University plans to expand its activities in the Business-angle for example by starting a third bachelor programme.

Goal S1 Provided the necessary accreditation and approval by the Accreditation Council ("Akkrediteringsrådet"), the IT University will start a bachelor programme in Digital Media and Design in 2009 with room for 80 students a year.

Goal S2 Assuming the basic funding ("basismidler") of the IT University is at least DKK 84 million in 2009 and at least DKK 84 million in 2010, the IT University will start a third bachelor programme in 2010.

6.1.2 Innovative Teaching

IT University Principle # 2 At the IT University, an ideal study programme is one that satisfies these three conditions:

1. It attracts a large number of well-qualified students, with an overrepresentation of excellent students
2. The academic contents and the teaching are both world-class
3. It gives the students the competences needed for the future job market

This principle has some significant consequences. Only by attracting a large number of well-qualified students can the IT University live up to its mission. The IT University does not compromise quality in the admission process in order to fill up study programmes. Therefore, if a study programme is unable to attract enough talented students, it may be closed down and the resources relocated to other activities.

Giving students competences that are sought-after in the job market requires a continuous dialogue between the university and the employers.

Evaluation and feed-back mechanisms play an essential role in implementing this principle. Since 2000, the IT University has twice a year conducted an Internet-based course evaluation used for systematic follow-up on the quality of the teaching and will continue with this practice:

Goal S3 The IT University will evaluate all its courses each time they are offered and will publish the results on the Internet. Also, the IT University will publish on the Internet an explanation of what has happened as a result of the outcome of the evaluation.

All MSc courses must use research papers in the curriculum:

> **Goal S4** All MSc courses must contain at least one refereed research publication in its curriculum.

> **Goal S5** The Employer's panel ("aftagerpanel") will publish their recommendations to the university at least once a year concerning how study programmes could be improved.

> **Goal S6** During at least one of the years 2009 and 2010, the IT University will be among the three best universities in Denmark, measured by what proportion of students who, according to the Entrepreneurship Barometer of the Ministry of Science, Technology an Innovation, feel inspired to start a business.

Providing world-class contents and teaching requires world-class faculty. That must be reflected in policies concerning hiring and staff development.

Also, our building could be used much more actively in promoting our view of what IT is, e.g., art, labs, events and physical study environment. The IT University will participate in the national accreditation exercise.

6.1.3 Innovative Research

> **IT University principle # 3** At the IT University of Copenhagen, *all* researchers are expected to be motivated by *both* a quest for fundamental insight *and* consideration of use.

Stokes[1] suggests a classification of researchers based on asking them two basic questions about what they are highly motivated by, as researchers: (a) a quest for fundamental insight; (b) consideration of use. He presents the four possible answers in the following diagram, placing famous scientists in three of the four quadrants.

Consideration of use?

Quest for fundamental understanding?

	no	yes
yes	Bohr	Pasteur
no		Edison

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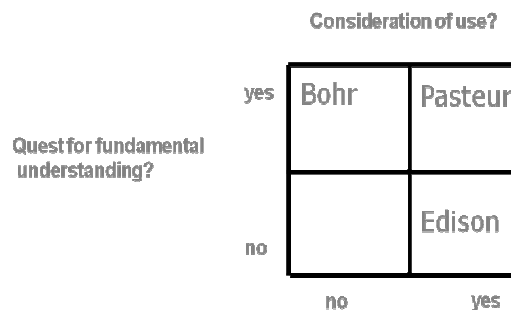
[1] Donald E. Stokes: Pasteur's Quadrant. Brookings Institution Press 1997

At the ITU, we are inspired by this two-dimensional classification of research, which we believe is much more useful than the traditional one-dimensional view, which would place Bohr at one extreme ("pure research") and, Edison at the other extreme ("applied research") and Pasteur somewhere in the middle, indistinguishable from researchers who are neither strongly motivated by deep insight nor by consideration of use.

A great deal of Information technology is constructive, as opposed to descriptive. In a subject where the possibilities of constructions of theories and concepts are limited by human imagination only, the quest for fundamental understanding is essential.

To the ITU there are particularly good reasons why IT-researches may want to be motivated by both a quest for fundamental insight *and* by a consideration of use because the latter is often an excellent test of theory and a necessary first step towards value creation.

Goal S7 Every year in the contract period, the IT University will select a few outstanding research contributions from some of its faculty demonstrating new fundamental insight and new possibilities of use.

6.2 Strengthening the IT University's Global Interaction

Vision (Global IT University) The IT University will become a "knowledge hub", through which students and researchers engage in global knowledge processes of exceptionally high quality.

6.2.1 Global Interaction

Globalisation is about tasks and competences being matched up, no matter their physical location. Work is carried out in globally interactive processes, where people who can be distributed all over the world work closely together, each contributing their unique competences to the outcome of the process. Globalisation of work processes has been going on for a long time in manufacturing, it is now happening with IT services, and we believe it is going to be the norm rather than the exception in most forms of service and production.

To globalise some production or service, being good at working with processes and having the necessary IT competences is crucial. Globalisation is therefore a huge opportunity for the IT University. Paradoxically, one of the most effective ways in which the IT University can live up to its mission (which specifically speaks of value creation in Denmark), is to create an environment that builds up competences in global interaction.

A central idea in this strategy is to regard education and research as processes, which, like many other processes, are candidates for globalisation.

We believe that students and researchers will increasingly want access to learning and knowledge provided by other universities than their own. Universities become access points of distributed networks of learning opportunities and knowledge. Students and researchers will naturally seek to access the learning and research opportunities of highest quality, irrespective of where in the network these are found.

Our vision is that the IT University will be seen by all its stake holders, including faculty and students, as something one uses in order to gain access to a global network of exceptionally bright people that one can work closely with, even though, physically, the network participants are spread all over the world.

To faculty, this can mean, for example, joint curriculum development with professors at universities on other continents, or joint research projects where researchers from different parts of the world with complementary expertise create a result that none of them could have achieved by themselves.

For students, it means getting a network extending beyond the fellow students and faculty at the IT University of Copenhagen to include students and staff at universities elsewhere in the world.

For external stake holders, it can mean using the IT University as a gateway/matchmaker to experts all over the world. Why should a Danish company who needs access to research competences have to shop around at many different universities? It may be that the desired research knowledge is not at the IT University, but if we know where it is, our stakeholders can benefit tremendously by our pointing them in the right direction.

The vision implies that the IT University becomes globally interactive, i.e. that all of the university's key business processes will eventually involve interaction with partners world-wide who each add exceptional value to the process. We believe that global interaction is a key instrument for achieving a ranking among the best universities in the world.

6.2.2 How to Become a Globally Interactive University?

A central theme of this strategy is to put global interaction on the curriculum and into the research agenda. Moreover, the theoretical

"A lot of people talk about 'globalisation' and use the word 'global' – at universities it often signifies international cooperation (in the form of exchange students or a mutual research projects). I would call that 'internationalisation' - something that universities and the research community have done for many years. All self-respecting universities do a large amount of international cooperation. At the ITU we see ourselves as one of the first universities who have gone down the path of global interaction in a new way."

Jørgen Staunstrup, provost

understanding of global interaction will be accompanied by changing the practices of teaching and research at the university, so that teaching and research in itself becomes globally interactive.

6.2.2.1 The Global Interaction Research Initiative

Starting with the research agenda, the IT University wants to start a **Global Interaction Research Initiative** (GIRI). GIRI is based on the idea of proposing Global Interaction as a unifying perspective for describing, understanding, and building globally-spanning sets of interaction patterns between hardware, software, humans, organizations, businesses, and society. The idea of global interaction is fundamental to the complex reactive relationships between the preceding — a concept that, when one is aware of it, can be observed everywhere: Hardware interacts; software interacts; concurrent programs interact; human and computers interact; humans interact; communities of e.g. gamers interact; businesses interact internally and externally; and citizens and societies interact. Thus, *global interaction* is a fundamental concept that can unify the description of underlying technological aspects of computing all the way up to describing and understanding human and organizational relationships.

The vision of the Global Interaction Research Initiative (GIRI) is to deliver research results which, 15 years from now, will have impacted the design of a platform for global interaction used by at least 100 million people.

This platform will build upon a conceptual understanding of the practices of global interaction. It will allow designers and users to apply new paradigms of interaction, which will help manage complex and globally interactive activities. These new paradigms of interaction will be made possible by novel software architectures and programming language principles, so that software engineers will be able to construct reliable software for global interaction much more easily than today. Finally, the technology will rest upon solid theoretical foundations, which will allow specialists to reason about global interaction with mathematical rigor and improve on the ad‐hoc interaction technology we rely upon today.

The GIRI research strategy consists of an interdisciplinary portfolio of *five research strands*. Like the strands of a rope, these research strands will together build a strong research agenda foundation for understanding and building global interaction. The five strands are: (i) Critical Studies of Global Interaction; (ii) Activity‐Based Global Interaction; (iii) Adaptable Architectures for Global Interaction; (iv) Languages for Global Interaction; and (v) Analytical Tools for Global Interaction.

The expected results include a theoretical and empirical understanding of global interaction; new human-computer interaction paradigms for global interactions; new hardware and software toolkits and architectures for building globally interactive systems; new programming language principles for development of globally interactive software systems; and tools for analysing, verifying and building dependable systems. Together, these theories and technologies will impact the future design of a platform for designing, building, and verifying globally interactive systems.

> **Goal S8** In 2009, at least four researchers at the IT University will participate in formalised globally interactive cooperation (with at least four participant collaborators). In 2010, the number will be redoubled to eight (and eight participant collaborators).

> **Goal S9** GIRI: During 2009 the IT University will create a work plan for the start of "Global Interaction Research Initiative" and implement the part of the working plan, covering 2009.

6.2.2.2 Global Interaction in Teaching

At this point, the challenge is to identify suitable collaboration models and related business models for globally interactive education. Collaboration may exist within a *spectrum* of loose-to-tight coupling between the partner institutions and individuals involved. A loose coupling means that partners only coordinate a small part of their joint effort, whereas a tight coupling involves partners working closely together on every aspect of their joint effort.

At one end of the spectrum, partners working with tightly-coupled collaboration have a strong basis for securing quality control through traditional measures. They also have strong commitment from both partner institutions. On the other hand, such collaboration projects have a high level of complexity, usually involving a large addition of administrative and planning tasks including preparation of the legal framework, contracting, financial implications etc.

At the other end of the spectrum, partners working with loosely-coupled projects usually have a low level of complexity and as such have a high scalability, since it can readily be duplicated with other partners. Moreover, loose coupling allows very heterogonous organisations to collaborate, since they do not have to agree on as much as in tightly coupled collaboration. On the other hand, it is not possible to use traditional quality control measures and this naturally calls for attention. It is, however, not given that loosely coupled projects lead to low quality. Wikipedia is an outstanding example of the opposite. However, to our knowledge, processes for securing quality of loosely coupled projects in the domain of university teaching and research remain to be developed.

We envisage collaboration within the entire spectrum described above and try to gain experience on various collaboration models through pilot projects. We have already launched a number of pilots including the joint development of an entire degree as well as joint courses/projects where students are required to do project work with students at partner universities. For the near future, we envisage a number of other experimental fields; e.g. mandatory courses taught by staff at a partner university, or creative use of online mass-collaboration tools in order to work on specific projects and problems with a multitude of specialist individuals distributed globally.

> **Goal S10** At the end of 2010, at least two major study programmes have incorporated the results of pilot studies of globally interactive education, for example in the form of globally interactive study activities.

> **Goal S11** By the end of 2010, the IT University will have an experimental online infrastructure, which supports students and researchers in global interaction, up and running.

6.3 Creating Value for the Copenhagen Region through Teaching and Research

The IT University has been admitting an average of 11 PhD-students per year since the university started. In 2008, this number rose to 18. We want to continue the increase to a doubling from the base-line of 11:

> **Goal S12** The IT University will admit at least 22 PhD students in 2009 and at least 22 PhD students in 2010, for which the IT University receives separate appropriation of DKK 4 million in 2010.

The IT University admitted 268 MSc students in 2008.

> **Goal S13** The IT University wants to admit at least 315 MSc students in 2009 and at least 345 MSc students in 2010.

The IT University admitted 47 bachelor students in 2008. The target admission number for the bachelor programme in Digital Media and Design is 80 students in 2009 and 80 in 2010. The target number for the third bachelor is 60 students in 2010.

> **Goal S14** The IT University wants to admit at least 120 bachelor students in 2009 and at least 180 bachelor students in 2010.

> **Goal S15** at least 40 % of the bachelor students who started their bachelor study in 2007 will complete their bachelor programme by 30 September 2010.

> **Goal S16** The composition of the Employer´s panel ("aftagerpanel") will reflect our desire to deliver competences that are sought-after in the Copenhagen region.

> **Goal S17** The existing M.Sc. study programme in Software Development and Technology is revised by 2010, so that it will become attractive not only to students who hold a bachelor from another university, but also to bachelors from the IT University itself.

> **Goal S18** The IT University will graduate at least 400 *cand. it.* for the total period of 2009-2010.

> **Goal S19** At least 56 % of the MSc students admitted will complete their degree in no more than scheduled time plus one year, measured as the key indicator G2.2 in Danish Universities statistics.

> **Goal S20** The volume of part-time education for the entire two-year contract period will be at least 264 full-time equivalents ("årselever").

> **Goal S21** In 2009 at least 7 and in 2010 at least 15 students will earn credits at foreign universities as part of their IT University education.

> **Goal S22** In 2009, at least 38 % of the IT University offered courses are in English, and in 2010, at least 40 % of the courses are in English.

> **Goal S23** The volume of study activities passed by students of other nationality than Danish must be at least 3500 ECTS in each of the years 2009 and 2010.

> **Goal S24** The number of research publications for the period 2009-2010 will be at least 1.4 publications per VIP FTE, including PhD students, per annum.

Goal S25 During 2009 the IT University will develop and implement a method of collecting data on the thesis writing process. By 2010 the IT University will introduce systematic evaluation and follow-up of the thesis writing process and the overall outcome of study programmes.

Goal S26 During the two-year period 2009-2010, the IT University will attract a total of at least DKK 30 million in external funding.

Goal S27 The IT University will attract at least DKK 4.0 million in external, non-governmental Danish research funds in 2009 and DKK 4.5 million in 2010.

Goal S28 The part of researchers and PhD students at the IT University who are non-Danish nationals will be at least 20 % in 2009 and in 2010.

Goal S29 The IT University will host at least two international conferences during the two-year period 2009-1010.

Goal S30 The IT University will send a total of at least 6 EU applications during the two-year period 2009-2010, more or less evenly divided between the two years.

6.4 Competence Development

The IT University will continue to develop the competences of all staff both in their specific areas of expertise and more generally, for example, in project management or English.

Goal S31 In 2009 at least five staff members will be trained as spokespersons for the IT University; in 2010 ten further staff members will be trained as spokespersons.

Goal S32 Before 2012, the IT University aims at developing and implementing a language policy to strengthen the English language at the IT University and offering access to extracurricular language courses (English, Danish, and possibly Chinese, and Spanish).

Goal S33 By the end of 2010, at least 90 % of all courses at the IT University will have learning objectives stated in terms of the SOLO taxonomy.

6.5 Efficiency and Cost-effectiveness

In order to do all the actions listed in this strategy with the limited resources available, it is necessary to constantly improve the efficiency and cost effectiveness of all work processes at the IT University.

Goal S34 The equity of the IT University will at no point in time be below 10 % of the annual expenses.

Goal S35 During 2009 the IT University will implement a model for project organization.

Goal S36 IT-benchmarking: The IT University will participate in cooperation in IT benchmarking with other IT institutions. The IT University will annually determine and publish the parameters of the IT University, which is part of the benchmarking (launched in 2006).

Goal S37 International benchmarking: The IT University will in 2009 apply for inclusion in "The Times Higher Education" ranking of universities.