

# ITU Education Strategy 2012 to 2016<sup>1</sup>

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IT University of Copenhagen

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## Summary

The present document describes the strategy of the ITU with respect to its study programs (excluding PhD studies). The overall goal of the strategy is to prepare the study programs for accreditation and to strengthen the existing study programs.

The educational strategy has the following six focus areas, each treated in a separate section of this document.

*Teaching-Research relation.* The strategy suggest we adopt a view on the term research-based education that places equal weight on the student learning key research results, learning research methods, and learning to produce research results. All study programs should adopt this practice. Further, we emphasize that at the IT University, research is the combination of the search for deep knowledge and consideration of use. Both of these aspects should be present in teaching.

*Student-centered learning and digitalization.* Universities today are expected educate a larger percentile of the population than earlier, and supply the country with experts of the highest level. To accommodate for this student diversity, we expect to push further on student-centered learning and in particular to push for increased digitization of our studies as a means to accommodate diversity.

*MSc revisions.* All MSc programs are to be redesigned to be attractive to our own bachelors, as well as the broad spectrum of bachelors they have attracted until now. The redesign of each MSc must be timed to fit with the first graduation semester of the corresponding bachelor program.

*Part-time education* is an important part of the mission of the IT University. However, some of the part-time programs lack scientific staff. This can bring problems with accreditation, since also the part-time programs must be clearly embedded in research.

*Quality assurance.* Accreditation places importance on routines of evaluation and follow-up. The IT University has a long established tradition for doing course evaluation. However, there are some obvious places we need to improve our quality assurance: curriculum compared to qualification frameworks, evaluation of projects (including thesis projects), and evaluation of entire programs.

*Plannning for new programs.* While the present strategy does not contain any plans for new educational programs, it is important to develop a framework for how and which new programs should be developed in the long term.

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<sup>1</sup> Approved by the management (direktionen) on December 22, 2011.

*Other strategies.* The educational strategy intertwines with the research strategy, the globalization strategy, the communication strategy, IT strategy and the overall strategy of the IT-University. This strategy will be revised when the IT strategy and globalisation strategy have been revised.

## 1 Introduction

The present document describes the strategy of the ITU with respect to its educations (excluding PhD studies). The overall goal of the strategy is to prepare the educations for accreditation and to strengthen the existing programs.

The strategy is developed within the framework of what the IT University considers a good education, namely

1. It attracts a large number of well-qualified 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

The focus in this document is on the second item. Only by addressing the second item can we make the educations of the IT University attractive for well-qualified students. And only by framing the contents and teaching with respect to item three, will we be able to sustain item one.

Needless to say, there are strategic issues regarding one and three as well. Each year the long-term budgets set the targets for the number of students to admit in the years to come for each program. The current long-term budget does not predict any raise in student numbers per se, and incorporates growth only due to our continued implementation of our bachelors programs. Hence, the goals in this strategy are to be fulfilled with the resources currently available – staffing, rooms, IT and other necessities.

The close collaboration with the employers' panel and a new goal in the overall strategy to develop methods to monitor the career start of our graduates serves to focus on item three.

The strategy has five overall elements in section two through six. They are all to be understood as contributing to our focus on strengthening the academic contents and teaching. Section two will address how to strengthen the relationship between research and teaching, and gives a definition of what we believe should be understood by “research-based education”. Section three addresses the important issue of student-centered learning, and opens for a revision of the daily teaching practices at the university to challenge each individual student to achieve his or her best. An important tool here is increased use of IT in teaching.

Section four concerns itself with revision of the MSc programs. The IT University has designed three bachelor programs in the immediate past. In the coming strategic period the corresponding MSc programs must be revised to accommodate students from the new bachelor programs, while staying attractive for students from other institutions. As such, this is an excellent example of work that must be carried out with a strong eye to item 1) above.

Section five is about our part-time studies. There are issues with respect to item 2) above that need to be addressed.

Finally, university educations must today be accredited, and we need to improve our quality control mechanism to meet the standards of accreditation. This is a balancing act where the control mechanisms should not draw focus from item 2 above, but rather work to supplement and actually help us improve on the content and teaching.

### 1.1 Process

In early spring 2010, a subgroup was working on making a strategy for the part-time educations, a work that by summer 2010 was subsumed by the work on a strategy of all of the educations under the ITU study board. A number of meetings and hearings have taken place in the fall of 2010 and spring 2011, ultimately leading to the current document.

The strategy has a number of long-term goals, each expressed in their separate section below. These long-term goals must of course be broken down to a number of individual tasks and projects. A separate task document contains the detailed break down, and is intended to be updated quarterly, whereas this document is intended to remain static.

Each year in the fall, the board initiates a university wide process in which the actual result goals for the following year are settled. The present strategy document and the task document is intended to serve as a basis for ensuring that the decided result goals further the overall goals in this document.

### 1.2 Context

A number of documents describe the overall purpose and strategies of the IT University. They form an important border within which the educational strategy has to be situated. The overall purpose of the IT University is:

“The IT University must conduct research and provide research-based training up to the highest international level in information technology.

The IT University will seek a public/private interaction in both education and research. The IT University must contribute to interagency cooperation between IT institutions within education and research. (...) The IT University will develop and implement education programs that are attractive to a large number of people. The programs must impart IT competences that are relevant to the present demand. Finally, the IT University must through its research contribute to scientific and industrial innovation.”<sup>2</sup>

In the above purpose, four elements are particularly worth noticing with respect to the education strategy: a) research-based education, b) interaction with society, c) educations should attract many students, and d) competences relevant to the present demand.

The mission statement of the IT University<sup>3</sup> takes item d) one step further:

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<sup>2</sup> Our own translation from the ordinances of the IT University: <http://www.itu.dk/da/Om-IT-Universitetet/Organisation/Bestyrelsen/Bestyrelsesmoder-2009/~media/B1FA9BFF0C2344A0B80AACF5030C8551.ashx>

<sup>3</sup> Decided by the Board of the IT University on Dec. 2, 2005.

“The mission of the IT University of Copenhagen is to deliver internationally leading teaching and research which enable Denmark to become exceptionally good at creating value with IT. Teaching and research in information technology include all academic activities which relate to computers.”

That is, the competences should not only be meeting present demands, but also help the nation to perform well in the future.

Our current status is, we believe, that we do have a good balance between these key issues on all of our programs.

In addition to the above issues, the vision for the IT University<sup>4</sup> plays an important role for our educations:

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

While that statement does not explicitly mention education, a lot of effort is currently being invested into global interaction for our programs, and this will be further strengthened in the years to come.

### **1.2.1 Resources**

An important context is to consider what resources are available to carry through the strategy. The educational strategy is anchored with the head of studies and the study-board. By the design of the matrix structure at ITU, there are no resources in control of the study board. The resources for implementing the strategy has to be drawn from the department – in the form of man power of the individual teachers, and importantly, the head of programs and head of studies, as well as administrative support from the research and learning administration. In addition, the study administration will deliver resources in the form of manpower; in particular the study coordinators play an important role. Some of the initiatives in the strategy will require support from the IT department, manpower to develop and maintain the changes necessary to implement the digitalization processes outlined in section 3. Finally, it should be noted that the building and rooms available is an important resource to utilize efficiently. As already mentioned, we cannot expect any significant increase in the available resources.

### **1.3 Target group**

The target group of the education strategy is mainly all employees with specific obligations and strategic responsibility towards the overall quality of educations at the IT University. The aim is to focus their actions in a strategic perspective. Therefore the education strategy has references to and uses internal terminology such as that of the globalization strategy. Another target group is the IT University Board.

### **1.4 Process onward**

Each fall, a discussion on the budget and result goals for the coming year are negotiated. The obvious onward process is that we each year will negotiate result

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<sup>4</sup> Decided by the Board of the IT University on Dec. 2, 2005

goals that will bring us further along the different parts of the educational strategy. The result goals are subject to quarterly follow up, and as such are a good way to ensure that those intermediate steps are taken.

## 2 Research-teaching relation

One of the corner-stones of university education is the coupling between research and teaching. In Danish *Forskningsbaseret undervisning*, in English research-based teaching. There is no single definition of what that concept really covers, and it is part of the present strategy to develop an understanding which is both in accordance with the requirements of the accreditation institutions, as well as grounded in the different subject areas at ITU.

The relationship between research and teaching is a field of its own. One of the most cited conceptual models is by Ron Griffiths<sup>5</sup>.

On page 14, he summarizes four different ways in which teaching can be related to research.

- Teaching can be *research-led* in the sense that the curriculum is structured around subject content, and the content selected is directly based on the specialist research interests of teaching staff; teaching is based on a traditional 'information transmission' model; the emphasis is on understanding research findings rather than research processes; little attempt is made to capture the two-way benefits of the research-teaching relationship.
- Teaching can be *research-oriented* in the sense that the curriculum places emphasis as much on understanding the processes by which knowledge is produced in the field as on learning the codified knowledge that has been achieved; careful attention is given to the teaching of inquiry skills and on acquiring a 'research ethos'; the research experiences of teaching staff are brought to bear in a more diffuse way.
- Teaching can be *research-based* in the sense that the curriculum is largely designed around inquiry-based activities, rather than on the acquisition of subject content; the experiences of staff in processes of inquiry are highly integrated into the student learning activities; the division of roles between teacher and student is minimized; the scope for two-way interactions between research and teaching is deliberately exploited.
- Teaching can be *research-informed* in the sense that it draws consciously on systematic inquiry into the teaching and learning process itself.

The first three concepts address the relation of research within a given subject and teaching, whereas the last bullet address the fact that the relationship between research and teaching is itself a subject for research, and that the results of said research informs the practical execution of the three other bullets.

A short version of the above, due to Michael Bradford:

- Learning about other's research

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<sup>5</sup> Ron Griffiths, *Knowledge production and the research-teaching nexus: the case of the built environment disciplines*, Studies in Higher Education Vol. 29, No. 6, December 2004

- Learning to do research – research methods
- Learning in research mode – inquiry-based
- Pedagogic research – enquiring and reflecting on learning.

The past goal, that all courses had at least one research paper in their readings, is an example of a research-led teaching goal.

*At the IT University we want students in each of our programs to be exposed to the first three relationships between research and teaching. We want all staff to get an understanding of the research informed teaching.*

At the IT University, research is ideally based on Pasteur's Quadrant<sup>6</sup>. That is, it should combine a quest for fundamental knowledge with consideration of use. While research at the IT University is based on Pasteur's Quadrant, the educations allow splitting fundamental knowledge and consideration of use in the individual courses. However, the student should be exposed to both aspects in each program. The reformulation of Bradford become:

- Learning about other's research and its applications
- Learning to do research – research methods and methods for their application.
- Learning in research mode – inquiry-based, and learning in usage mode – innovation based teaching
- Pedagogic research – enquiring and reflecting on learning.

The strategy for strengthening the relation between research and teaching for the coming years will focus on two goals:

1. In 2016, all programs have mapped out and documented how all students in that program are exposed to all three relationships between research and teaching.
2. In 2016, more than 45% of all MSc students perform their thesis work in thesis groups. More than half the students work on topics related to either research projects and/or to external collaboration.

The first goal relates to the MSc thesis, and includes a goal of getting more students to work in groups in order to promote peer learning among students. In addition, it is our goal that the various research projects carried out at ITU will take into consideration how to include MSc students.

An improved focus on the meaning of research-based teaching, and how to operationalize it contributes to improving the quality of our programs in a number of ways.

- Working towards a closer relationship between research projects and MSc thesis work will be an important thing for the students to feel they are really part of the university proper, and to encourage the research project to take part in the educations.
- A shared definition of the relationships between research and teaching is a necessity for moving forward on raising the academic level, making it clear what issues are involved.

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<sup>6</sup> Donald E. Stokes: *Pasteur's Quadrant*. Brookings Institution Press 1997

- Group work might seem detached, but is an important tool in improving both quality and efficiency.

Notice – a university must deliver research-based teaching at all levels, including full time programs such as MSc, BSc, and at the part-time Master program. The level to which the three elements are learned differs – as reflected in both the Danish qualification framework and in our study regulations.

### 3 Student-centered learning and digitalization

The previous section was in part about the contents of the educations. The next sections address the pedagogical aspect of our programs.

The teaching at ITU is driven by great enthusiasm; many different forms of learning are supported. It is this drive and engagement we should like to push further.

Student-centered learning is a term that to some extent is used as an antonym to instruction-centered learning. Instruction centered being that it is the form (lectures) and resources (staff and rooms) that dictate the pedagogies. Student-centered learning, on the other hand, is based on constructivism, emphasizing development of knowledge and competences as being based on the student's prior knowledge and experience. That is, teachers cannot control what students learn by just lecturing and determining the curriculum. In student-centered learning, students are seen as individuals with different capacities, different ways of constructing own learning, different motivations and ambitions. At ITU the following values are thus part of our understanding of student-centered learning

1. Pedagogies must be aligned with the intended learning outcomes
2. Pedagogies must be aligned with the student body (different students might require different pedagogics)
3. Resources (rooms, staffing, materials (including computers) and learning technologies must be aligned with pedagogies
4. The students are expected to take responsibility for own learning
5. The teaching staff should facilitate the student in taking that responsibility

Establishing intended learning outcomes has been the first important step, as that is one of the two foundations upon which the pedagogies should be based. The other is to align the pedagogies with the student body. To do that optimally, the teacher and the program managers need to have instruments that give them timely and accurate indications of the learning processes of the students.

When the pedagogies are aligned with the intended learning outcomes, it is not obvious that all learning activities are best done in a setting that is slotted into two hours of lecture and two hours of exercises. The optimal setting might easily lead to a situation where many learning activities have dynamic resource needs. It might be that the boundaries between lecturing and exercises become blurred, or completely new activities need to be scheduled and supported. It must be expected that the current static resource allocation will be put under pressure in the years to come.

One of the overall competences of the academic MSc degree is “to be able to take responsibility for own professional development and specialization.”<sup>7</sup>. To further this goal, the student should be able to practice throughout the studies to this end. And the educations should be designed to draw on the resources the students represent in this context to substantiate that goal.

Learning activities based on student-centered learning should make it possible for students to interact with the academic content in a variety of forms, such as visual and oral presentations, training, repetition, exploration, discussions, tests, peer and teacher feedback, note taking, portfolios. The use of selected IT tools can in some cases enhance student-centered learning activities in a way that is not possible in the traditional face-to-face session.

Lecture podcasts allow students to repeat. Online polls allow the teacher to test students in an easy on the spot evaluation. Screen capture systems with voiceover can improve the quality of feedback on assignments or explain difficult procedures step by step. Digital note-taking systems allow students to take their own or group based notes during lectures. Wikies and other platforms can enhance student designed group work. E-learning systems allow teachers to create easy and clear access for students to course materials, learning outcomes, lecture plans, hand-ins ect, so that they can more easily organize their progression.

It is not easy to see whether a given program or course is designed according to such practice. However, in summary, the following goal is set:

1. By 2016, all (90%) courses must have gone through a process that ensures that the structure of the course, the learning activities and the intended learning outcomes are based on student-centered learning.

As can be seen above, IT tools can be used in many ways to support student-centered learning. In addition, it would be very strange if the IT University did not try to push on the usage of IT in its education. Hence, we have this goal on the usage of IT in education:

1. By 2016, all<sup>8</sup> courses are using IT to support student-centered learning. The way this is done should be described in the course descriptions.

The focus on student-centered learning can in some respect be seen as the students' view of quality. Item 2 from the introduction, that the academic contents and the teaching are both world-class, is stated from a student external perspective. The initiatives in this section have their focus on how to let the student experience this goal. Item two is only a success if the students experience it as such, because if not, we must expect that the programs will fail to attract well-qualified students.

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<sup>7</sup> The Danish qualification framework, 2008.

<sup>8</sup> 'All' is here taken to mean that those courses where this is not the case have given an explicit explanation as to why using IT in this course would degrade the pedagogics and give a less student centered learning experience.

## 4 MSc revision

In the recent years, three bachelors programs have been established. According to Danish law, all students accepted at a bachelor program must be offered acceptance to an MSc program *in natural continuation of their bachelor*. Our MSc programs have from the outset been designed to accept student without restrictions to their bachelor subject. Instead students have been screened by their grade average, and an individual letter of intend. To accommodate the requirement of *natural continuation* for our own bachelors, as well as keeping our MSc programs attractive to other bachelors, all of the MSc programs have to be redesigned. The SDT program has already undergone such a redesign, and currently the DDK program is under redesign to be ready for the first ITU bachelors in fall 2012. Finally preliminary work has started to enable EBUSS to be the natural continuation of the GBI program.

1. All MSc programs are redesigned to be attractive to our own bachelors, as well as the broad spectrum of bachelors they have attracted until now. The redesign of each MSc is timed to fit with the first graduation semester of the corresponding bachelor program.

In addition, there is a certain pressure to collaborate with the new university colleges to ensure that their graduates (*professionsbachelor* in Danish) can be accepted into the MSc programs. While they are not per se ruled out, as anyone with a bachelor can apply to our MSc programs, we might come under pressure to ensure that they stand a reasonable chance to get accepted. A reasonable first step here is to establish a routine for monitoring the background of those applicants who are accepted into our programs.

In the research strategy, the possibility of moving to a 3+5 system – 3 years bachelor followed by 5 years PhD – is mentioned. This can lead to a blurring of the current difference between the educational levels. It seems obvious that a large amount of regular course work has to be reused for the beginning of the 5 year PhD programs course requirements. To make efficient use of resources, some way to integrate the two educations must most likely be found. A related topic is that relatively few MSc graduates currently pursue a research career. The MSc educations are expected to work on this issue with the PhD study board.

## 5 Part-time studies

The primary motivation for part-time students to enroll in further education is because they view it as promoting their career. The reason for them to pick university education is an expectation of research-based teaching as opposed to vocational or product specific courses.

Hence, it is in particular important to develop the part-time programs in close collaboration with employers. Both regarding program development, course development, course execution, and related activities. The collaboration has to take place at all levels, including course level, head of program, part-times studies and university in general.

Part-time students differ from daytime students in a number of ways, which must be addressed. In particular we notice:

- Part-time students study outside normal hours. The organization should take that into consideration, for instance by giving access to facilities (study administration, help desk, etc.) at alternative hours (access by phone during evening/course hours the first weeks of the semester) and/or by giving part-time students their own “intranet” when contacting the organization.
- Some part-time students attend regular classes. Part-time students can contribute with their experience. Full time courses of particular interest to part-time students should include the head of the relevant part-time programs in their development.

Part-time studies must have the relation between research and teaching strengthened.

- Part-time studies should be based on the same principles as our other programs as outlined in previous sections, research-based, student-centered, and digitalized. In particular part-time students can expect to be taught in some of their courses by full professors. All head of programs should be VIP, ratio of DVIP/VIP lectures should not differ from the overall ITU ratio. A majority of those who are course responsible should be VIP.
- As mentioned in the section on the relation between teaching and research, external lectures should be used as resources in relation to industrial contact wrt. teaching as well as research projects. Being external lecturer should be seen as a positive addition to one’s CV (as opposed to something done merely as a friendly act). ITU should work to improve exchange of experiences between external lectures and between external lectures and scientific staff. Better contact between external lectures and research groups.

The poor grounding of the part-time studies in the permanent scientific staff is seen as the major issue to tackle. All experience show that the body of teachers, scientific as well as external are very dedicated, and ensuring that more permanent scientific staff is engaged in the part-time is a necessary prerequisite to be able to move forward at any of the above points. Hence, the only explicit part-time goal that *must* be addressed is:

1. The part-times studies will have a similar (within 15%) VIP/DVIP ratio as the daytime programs. The heads of programs are all on a permanent contract with ITU.

Part-time educations are an important part of the mission of the IT University. Over the last few years, the students who have enrolled at the part-time courses and programs have gone down, and it has been difficult to meet the budgeted numbers. This constitutes a problem, both in the short run (wrt. budgets), and in the long run (not fulfilling our mission). It is very hard to point to any specific single cause. The strengths of the current programs are roughly: dedicated teachers, volume, the ITU brand, subject relevance and spirits in the classes. The weaknesses are lack of researchers in the programs, visibility to employers, lack of time to further develop the programs, lack of infrastructure and synergies, ambition level, and marketing. It has been an observation that the single subjects are well liked, but single subject courses lack prestige in society, and hence to not have the right career promoting affect we should like it to have.

We are currently in a process on trying to formulate a specific goal that will supplement the one above, one addressing raising the popularity of the part-time programs, and at the same time sets a strategic goal that will sets the frame for concrete actions to be taken.

## **6 Quality assurance**

Accreditation of university programs place importance in routines of evaluation and follow-up. The IT University has a long established tradition for doing course evaluation, but has traditionally done less with respect to non-course based teaching activities, as well as overall evaluation of its programs. In collaboration with the study administration and learning unit, it is our strategic goal to strengthen quality assurance at the three levels described below.

### **6.1 Program level**

1. A short document must be available for each program describing how the learning activities add up to the required academic level described in the curriculum.

### **6.2 Course evaluation**

2. All learning activities, not just courses, must have an associated quality assurance; with systematic and transparent follow-up procedures.

### **6.3 Thesis writing and program outcome**

3. A systematic evaluation and follow-up procedure is established for thesis projects as well as overall educational program.

## **7 Planning for new programs**

The IT University must contribute to enable Denmark to become exceptionally good at creating value with IT. The educations contribute to this by educating the workforce that will do this. While the present strategy does not contain any plans for new educational programs, it is important to develop a framework for how and which new programs should be developed in the long term.

## **8 Relation to other strategies**

### **8.1 Research strategy**

The main overlap is the challenges in designing a 3+5 model, and in increasing the number of students pursuing a PhD. Both of the these areas can be read as a need to develop new courses that cater in particular for research minded students. However, from a resource perspective, that will likely not make sense. Instead, it is necessary to adopt student-centered learning and develop ways of teaching that can satisfy all.

The research strategy and the overall strategy operate with a notion of strategic areas. For an area to be strategic, it should (among other criteria) relate research and teaching. At the moment it has not been discussed what such a relation en-

tails, but a closer tie between research and education is a major issue in this strategy, as discussed in section 2.

## 8.2 Globalization strategy

The corner stone of the globalization strategy is the fundamental observation that goods and in particular IT-based services are only fully understood in the context of “one world”. It is commonly accepted that students must through their studies learn to communicate, to work in teams, to work in cross-disciplinary contexts and so on. Students are expected to have both concrete hands on experience in doing this, and some theoretical understanding of these issues that allow them to reflect on their behavior in such settings. *Global interaction* raises the bar for all these skills, as we expect our students to be able to do all of the above, in contexts where the partners are from other cultures, from other time zones, accessible only through communication via electronic means.

While we want all our students to experience global interaction, we also want to encourage students to go abroad for a semester to emerge themselves in a different educational and cultural system than the Danish and that of the IT University. One cornerstone here is to be flexible in the interpretation of the learning goals, allowing students to be able to get the credit transfers necessary. Another approach is “windows” in the programs that are designed to make it easy for the student to substitute an entire semester with a study abroad.

The details of the globalization strategy outlines a number of goals to be reached in the years to come, and play an important role in the yearly goals for the development of the educations at ITU.

## 8.3 Communication strategy

A key overlap between the educational strategy and the communication strategy is the pillars of what a good education is, namely one that attracts a large number of students, that they are relevant, and that it is of high international level. In practice it implies that the academic and communication concerns have to be aligned. It can be expected that such an alignment can be seen as intervening in academic contents by some academic staff.

## 8.4 IT strategy

The digitalization of our educations that are expected to take place in relation to section 3 will need to go into the IT strategy.