

Preamble to ITU Strategy 2017-2021

ITU's Mission

Danes depend on IT. Indeed, IT is now visible everywhere in the Danish society. Most Danes own one or more computers from laptops and smart-phones to embedded computers in their car or sports gadgets. The technology has become sufficiently user-friendly that most Danes possess user skills at some level.

However, the fact that most Danes have become habitual IT users does not imply that IT has now become a commodity. Quite the opposite. IT is an indispensable driver of *change, innovation* and *economic growth* throughout the Danish society. Perhaps more than any other group of experts, those people in Denmark who have a deep and relevant understanding of IT have become agents of change, of innovation and of economic growth; they have become the people who change every aspect of modern Denmark.

Unfortunately, the country suffers from an almost chronic shortage of such experts. Not even outsourcing of IT jobs to other parts of the world has satisfied the demand.

Value creation with IT can take many different forms, both commercial and non-commercial. Being a university, ITU is particularly interested in value creation that requires IT expertise. Indeed, ITU's market (i.e., the market that ITU is in) is the market for IT expertise. For brevity, we sometimes abbreviate "the market of IT expertise" to just "the market", when it is clear from context that no other market is meant. The reason that we refer to the collective pool of IT expertise as a market is that, just as with many other kinds of markets, there are mechanisms of demand, supply and price in play, which necessarily influence the strategy of the university. For example, it must influence the strategy of the university what kinds of IT expertise is requested from private and public enterprises located in Denmark, be it through graduates or researchers.

ITU's Mission

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

The market of IT expertise is global by nature; however, it follows from the mission of the IT University of Copenhagen, that we exist specifically to shape a well-functioning market for IT expertise in Denmark. In particular, the university must collaborate closely with stakeholders in Denmark on both research and teaching. Obviously, a well-functioning market for IT expertise in Denmark has to be well-connected to international IT expertise, so we "think global and act local".

ITU has a role in understanding, contributing to and shaping the market. As a university, we have an obligation to try to predict what competences will be in demand years from now, although they are not in high demand right now. At the same time, we have an obligation to ensure that every graduate graduates with some competences that are in demand here and now.

ITU's Vision

ITU's vision

We create and share knowledge that is profound and leads to ground-breaking information technology and services for the benefit of humanity.

The vision rests on the observation that, very often, doing something that leads to ground-breaking information technologies or services requires collaboration between people who hold different perspectives on IT. Operating educational programmes that give students T-shaped competences (i.e., depth and breadth) obviously requires collaboration between faculty who possess very different kinds of expertise.

The Importance of Danish IT Research and Research-Based IT Education in Denmark

As the sheer amount of data, information technologies and services on which we depend increase, so does the complexity of the field. Not only are more experts needed, it also takes more to become an expert.

This is where IT research comes in. Like all research, IT research creates knowledge. Knowledge, unlike buzzwords of the day, is profound and long lasting. Research-based education propagates such knowledge, thereby enabling those who acquire it to act based on knowledge, rather than on trial and error.

Relevant IT research results in knowledge that is valuable for the practice of IT. Relevant research-based IT education gives students relevant knowledge based on IT research.

Let us illustrate the importance of relevant IT research and of relevant research-based IT education by way of some examples. We emphasize that these are only a few examples and that many other, equally relevant, examples could be listed.

1. Software developers who develop the software that is embedded in life-critical services (for example in transport safety systems) depend on state-of-the-art research-based knowledge in order to make their systems trustworthy;
2. Suppliers of IT-based services, as we know them from every bank to every hospital, can benefit from research-based knowledge to create systems that protect the assets and the privacy of end users against cybercrime;
3. Business people have always used market data to spot opportunities; but with today's technology, business people have the opportunity to collect data about their customers and competitors and process it in real time based on a vast supply of data sources. Nowhere is this more so than within the financial sector after the advent of high-frequency trading, but, increasingly, big data, algorithms and data mining permeate manufacturing; logistics; transportation; health care; crime detection; entertainment; energy and agriculture;
4. Computers have become machines of interaction between humans. Algorithms select what information we are exposed to. This gives rise to many interesting questions. For example, as more and more information is algorithmically mediated, how can we still be informed citizens? How can one use modes of interaction developed in one domain (e.g., social media) in a different domain (e.g., education)? Relevant IT research and research-based IT education can provide knowledge about what works and what does not work in different settings.
5. Denmark is an early adopter of digital services in the public sector. Many of these IT projects go well, but when they fail, as they sometimes do, the consequences are often severe. Even non-IT professionals, for example executive management in government agencies, can greatly improve their ability to manage risk in IT projects by acquiring basic knowledge concerning what it takes to make an IT project successful. Relevant IT research and research-based part-time IT education can provide such knowledge.
6. Children spend more and more time using social media and playing computer games. Parents, teachers and policy makers wonder how this affect the children and what forms of boundaries they may have to set up for children. Research into children's use of social media and games can enable

parents; teachers and policy makers base their decisions on knowledge, rather than just on opinions.

Common to all the above examples is that Denmark can do *so* much better with relevant IT research than without it. There is a huge difference in capacity between those who can create value with IT in ways that live up to the standards set by state-of-the-art IT research and those who cannot. The former have at their disposal a foundation of specialised knowledge created over decades by a global research community; the latter have to improvise.

In short, *both* the IT research challenges *and* the opportunities for experts with deep and relevant understanding of IT are formidable. Within the IT industry alone, DI Digital estimates that, if nothing is done, the unmet demand will increase to more than 3,000 IT specialists by 2020 (DI ITEK, 2015). That number does not include the underserved need for relevant research-based IT knowledge *outside* the IT industry. According to a report commissioned by the Danish Ministry of Business and Growth, the shortage of graduates with an ICT specialist profile within the private sector alone may reach 19,000 by 2030 (Højbjerg Baruer Schultz, Kubix og Alexandra Instituttet, 2016).

To sum up, the IT situation in Denmark is somewhat paradoxical. On the one hand, most Danes have access to and use information technology every day, making IT look like a commodity. At the same time, the market for IT expertise is anything but a commodity market. People with deep, relevant insight into how to create value with IT are a scarce resource. The number of such people is growing, but so is demand for them. Both public and private enterprises are dismayed with having to slow down growth and development because of the scarcity of people with the required IT expertise.

The essence of ITU's strategy is therefore straightforward, namely *to increase - as much as possible - the number of people in Denmark who create value with IT in ways that live up to the standards set by state-of-the-art IT research.*

ITU's Position Concerning Teaching versus Learning

It has become customary to distinguish between a teaching and a learning perspective on education. Teachers teach; students learn. One also sometimes refers to the learning environment, meaning the environment that the student experiences at the university including, but not limited to, physical infrastructure and use of IT in learning activities.

ITU does not regard education as a process of transmission of knowledge from a teacher to a student. That view would downplay the importance of the role of students in the learning process. Conversely, ITU does not regard education as being all about the activities that students perform in order to learn, since that view would downplay the role of good teaching and of a good learning environment.

Rather, this strategy is based on the observation that teaching activities, learning activities and the learning environment are all co-created by faculty, students and staff. Indeed, we believe that achieving excellence in education requires intense collaboration between faculty, students and staff.

ITU Strategy 2017-2021

ITU's strategy for delivering on its mission and pursuing its vision is to increase as much as possible the number of people in Denmark who create value with IT in ways that live up to the standards set by state-of-the-art IT research. ITU does so primarily through Research and Research-Based Education.

Research

All research at ITU aspires to be profound and to contribute constructively to the creation of ground-breaking information technology or IT-based services. ITU conducts and values excellent IT research. All ITU researchers publish in peer-reviewed journals or conference proceedings. All ITU researchers contribute to the research-based teaching of the university and all senior researchers engage in externally funded research. ITU's researchers create new knowledge, as witnessed by peer-reviewed research publications and PhD theses. Engaging in externally funded research involves ITU building and maintaining relationships with external partners. The output from externally funded research, in addition to new knowledge, is market understanding, i.e., identification of research challenges that are relevant in the market in which the partners operate. Some ITU researchers combine new knowledge with market understanding to create ground-breaking technologies or services, perhaps with the help of the university's commercialisation services. The university attracts outstanding researchers who identify with the mission, vision and strategy of the university. ITU is known for its researchers; its peer-reviewed publications; its PhD graduates; its societal outreach; its collaborative partners; the high levels of external research funding; and the ground-breaking technologies and services that originate from the university.

Research-Based Education

All study programmes at ITU are carefully designed and operated in pursuit of ITU's notion of what constitutes an ideal study programme, namely that it attracts a large number of well-qualified students; that both the teaching and the contents are world-class; and that the students acquire competences that are in high demand in the labour market. In particular, ITU does not operate full-time study programmes that are small¹ or have employment rates below the average employment rate of university-level full-time study programmes in Denmark. Moreover, the university only admits students whom it believes have the potential to create value with IT in ways that live up to the standards set by state-of-the-art IT research. The engaged ITU students and the learning environment, which they co-create with faculty and staff, constitute one of the strongest assets of the institution. ITU is known both for delivering a large number of sought-after IT graduates and for its entrepreneurial graduates, who create businesses and jobs. The graduates from the part-time programmes are at the forefront of digital transformation of their professional domain. ITU builds understanding of the market through market analysis and through the work with its employers' panels. ITU tackles competence bottlenecks at the high end of the labour market through creation of new, demanding study programmes. ITU systematically follows up on the quality of the study programmes and resolutely fixes serious issues, when they arise. ITU only employs teachers and researchers with teaching obligations who have a passion for teaching and who are good at it. ITU values excellent teaching and shares best practice within teaching. ITU students recommend the university to their friends.

¹ As a rule of thumb, we say that a study programme is small, if it admits less than 50 students in semesters where it admits students.

Quality, Resources and People

Achieving excellent research and education requires collaboration between faculty, staff and students. All three groups create for each other work and study processes that are effective and efficient. ITU continuously monitors and improves quality in research and education, based on university-wide policies, standards and procedures. ITU manages its finances carefully, in order to avoid waste and create room for investment in new activities that further the strategy.

Both scientific employees and other employees enjoy working at ITU and recommend the university to their peers. ITU wants to change the gender balance to achieve a larger proportion of women among students and researchers.

References

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