

Five technological Revolutions and challenges for the university in the digital age

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Estonia has earned a place in the world as an advanced digital country. It is now time to take the next step. The 100th anniversary of TalTech is the ideal moment to consider such a leap ahead.

Historically, technological revolutions have gone far beyond the new technical tools. They have changed the paradigm for organizational models and innovative behavior. They have also redefined the social roles that universities must prepare for.

During the first industrial revolution at the end of the 18th century, universities educated the very narrow elite of society, the aristocrats, the leaders of the church and of the military. For the age of steam, railways and mechanization, from the 1830s, it was already important to also educate the financial and business leaders and some of the legal, medical and other experts that supported the political leadership. The next revolution, from the 1870s to WWI, was a big explosion of heavy engineering innovation –chemical, electrical, civil, naval– so it saw hundreds of scientific and technical universities emerge across Europe, America and elsewhere destined to educate the new science and engineering leaders, together with all the previous professions (TalTech was created towards the end of that revolution and the beginning of the next). The Age of oil and mass production in the 20th Century professionalized management and added the education for business leadership to all the previous specialties.

Each of those revolutions widened the leading elites and multiplied the roles they were expected to fulfill. They also demanded certain types of behavior to suit the responsibilities and expectations of society in each case. The hierarchical pyramids of the mass production era and the post-war boom expected a clear division of labor, specialization and respect for power. In a sense it was a civil version of the military structures. And innovation was also very centrally decided and organized and generally counting on it coming only from a separate R&D laboratory. So, education was also about discipline, answering questions in exams and specializing. The teacher was the impersonation of the future boss. And the university itself was also very hierarchical.

In the current information revolution, apart from the need for universal access to the all-pervasive digital space, the world of work has been radically transformed, and there is much more to come. Not only is individual entrepreneurship much more common, but that sort of

self-directed innovative behavior is expected even in the largest corporations. Therefore, universities must prepare people for a world of creative working and living. Students must acquire a solid basis for lifelong learning; recognize that innovation and creativity are the norm; learn to ask questions, not mainly to answer them; set goals and work by projects and in teams; become autonomous, self-managed and self-taught; get used to continuous improvement and evaluating alternatives; in other words, we must prepare people for change as the new routine.

That means the university itself must make a leap, being open for life-long learning, offering flexibility for interdisciplinarity, with a strong connection with society and the world of work and innovation. And teaching methods must also move towards greater participation, perhaps 'flip the classroom' –video class at home and discussion and questions in class– promote participation and team exercises; connect with real problems and do research and project work, while engaging in continuous improvement and innovation. The old power relationship teacher-student is obsolete and is better replaced by that of facilitator and self-managed learner and discoverer.

That is the major challenge facing today's universities. Societies that create dynamic professionals, by understand and applying an adequate direction of change in education, will be the winners. Estonia has a head start already. The next step is there to be taken.