Reconciling Multiple Stakeholders in University ICT Curricula Development: Preliminary Lessons Learned from Poland and Norway

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Abstract

Shaping university ICT-related module curricula involves multiple stakeholders and formal and informal procedures. This paper identifies the main stakeholders of university curricula development and investigates how curricula are shaped. Based on semi-structured interviews with university teachers at Krakow University of Economics, Poland, and the University of South-Eastern Norway, the preliminary, inductive analysis of the qualitative data allows us to propose the Curriculum Redesign and Engagement for Advancing Tech Teaching and Education (CREATE) model of curricula changes. CREATE acknowledges the power of intrinsic motivation of the teacher, and it incorporates the dynamics of technology push factors and primary stakeholders (teachers, students, graduates, university, national and international institutions, and employers).

Keywords: curricula development, university, labour market needs, stakeholders.

1. Introduction

The rapid advancement of technology and its growing impact on various fields have made Information and Communication Technology (ICT) a vital component of higher education [18]. Universities worldwide have incorporated ICT-related modules and programmes into their curricula to equip students with the necessary knowledge and skills to thrive in the digital era [17]. Nevertheless, the process of shaping university curricula is intricate and involves numerous stakeholders combined with both formal and informal procedures [11]. Some research works are related to this topic [16], [8], [15] and attempts have been made to develop frameworks that capture multiple stakeholders' perspectives of curricula shaping, e.g. [7], [4]. However, these frameworks are rather of a conceptual nature, whereas there is the need of capturing stakeholders' interrelations based on empirical data.

Recognizing the importance of understanding the key players in curricula development and their roles in shaping learning outcomes, this research investigates the curricula development process in Norway and Poland. It is part of a larger project to improve the alignment of ICT education with the demands of the labour market. The main goal of our research is to better understand the roles of stakeholders and their

interconnectedness in order to better match teaching not only to the needs of the market, but also to the capabilities of the academy. Specifically, the research questions guiding this study are as follows:

- RQ1: Who are the stakeholders in the environment or ecosystem responsible for shaping curricula?
- RQ2: How are curricula designed to accommodate the needs and requirements of multiple stakeholders?

By examining the factors that influence curricula development and the roles of various stakeholders, our study aims to provide valuable insights for educators, policymakers, and other stakeholders involved in ICT education. Ultimately, our research contributes to the ongoing dialogue on effective curriculum development in the digital age, helping to better align ICT education with the demands of the labour market.

The following section provides the background for our research, including an overview of international and national regulations concerning curricula development. Subsequently, the research methodology is presented, along with the results of qualitative data analysis and a proposed framework. The paper concludes with a discussion and final remarks.

2. Research Background

2.1. Curricula Shaping

Some aspects of the curricula shaping procedure related to supporting education by ICT have already been tackled in prior research works. For example, ICT tools that might be used in supporting curricula change were discussed by Voogt and Pelgrum [20]. The role of teachers as primary drivers of curricula innovation was emphasised by Makrakis and Kostoulas-Makrakis [9], who explored ICT-enabled education for sustainability.

Regarding the content of ICT-related courses, Association for Computing Machinery (ACM) provides periodical guidelines on what it should contain [1]. However, its guidelines do not involve the procedure of curricula development. Some research works emphasised the need to undertake a holistic approach to the education of ICT specialists [2] and pay attention to the development of generic/soft/transferable skills [3]. The need to undertake country-specific approaches for ICT curricula development was emphasised as some local environments might differ [15].

The discussion of stakeholders involved in curricula development was provided by Sinclair et al. [16]. They pointed to universities, businesses, and governments as the main drivers of curriculum shaping. However, they also paid attention to learners who must be prepared to meet industry needs but ultimately emphasised that their role is underestimated in curricula development. The curricula should be flexible and adaptable to meet the challenges of evolving industry and comply with up-to-date academic research.

2.2. Institutional Determinants

Depending on the scope of influence, three categories of institutions related to the curricula development can be distinguished: international organizations, national institutions, and Higher Education Institutions (HEIs) (e.g., universities). The first category, international organizations, includes all organizations focused on the analysis of global trends of IT development, their impact on the labour market, and linkage with or impact on education practices. These organizations are trying to anticipate the future shape of the labour market and its impact on requirements for HEIs graduates. In that way, they have an indirect impact on curricula development, being the inspiration for other participants (stakeholders) to act, e.g. OECD - Organisation for Economic Co-operation and Development [13], ILO - International Labour Organization [5]. This category also includes international organizations which publish the curriculum standards or provide certification programmes for the universities based on their own well-recognized standards. In that way, they have a more direct impact on the curricula

development process, e.g. Association for Computing Machinery (ACM) with its Computing Curricula 2020 [1], companies such as Microsoft or Oracle with their own education programmes or formal organizations such as European Commission, whose recommendations can directly impact education policy in several countries, also influencing the curricula development in that way.

More direct impacts on curricula development have national institutions, especially government ones. Depending on legal regulations, they play different roles in curricula development. Typically, legal regulations define the requirements for different levels and forms of studies, e.g., the number of ECTS (European Credit Transfer and Accumulation System) points, minimum study duration, and teaching staff requirements. In the case of Poland, the important role plays the Minister of Education and Science, which is responsible for approving the curricula of new fields of study (for all HEIs) and controlling their implementation, transferring some of its powers to subordinate institutions, e.g., Polish Accreditation Committee. While the curricula development process is left to the competence of the university and its units, the Minister must approve the final curricula [8]. In the case of Norway, universities have more autonomy. Legal regulations define the general framework for developing curricula (starting new studies), but the whole process is left to the competence of universities and their units (boards) [19].

The internal regulations of each university define the process of developing curricula. University statutes and regulations ensure legal compliance and describe the curricula development process in detail, pointing out what units or positions are responsible for every step (development, evaluation, approval, modification, etc.). These internal regulations create the organisational frameworks for curricula development (creation or change).

3. Research Methodology

Our research on how teachers make curriculum changes is done by an inductive approach. Inductive studies can be used to theorize observed patterns in technology use, user behaviour, or organizational practices [12], [21]. The theoretical abstraction can potentially help the design and implementation of curricula in universities. Orlikowski and Iacono [14] argue that inductive studies can be used to theorize the IT artefact and explain how technology is shaped by and shapes social practices by analysing how individuals and organizations use technology in different contexts.

To obtain a broader perspective of ICT curricula development, we investigated this process at two universities in two countries, the Krakow University of Economics, Poland (KUE) and the University of South-Eastern Norway (USN). In May 2022, we conducted semi-structured interviews with teachers (twelve at KUE and three at USN) acting as course coordinators responsible for curriculum updates. The interviews lasted 15 to 30 minutes each and were done on-site or via MS Teams. The following general questions guided our interviews: (1) What do you change in the teaching modules (subjects/curricula)? (2) What is your motivation for changes in the curriculum? (3) How often do you make changes in the curriculum? First, we transcribed the interviews (consent were obtained from interviewees). Second, we performed open coding of the data gathered and marked themes in the text related to guided questions 1, 2, and 3. The themes were initial categories discovered during the open coding process. Third, we performed axial coding and extracted final categories and subcategories.

To better understand the organizational context, at KUE we analysed 31 proceedings from the meetings of the bodies responsible for changes in curricula from the past three years. They concerned nine courses covering 87 subjects related to ICT. The sources of the changes include compliance with formal regulations (both external and internal) and adaptation of the curriculum to the needs and requirements of the stakeholders (students, labour market).

4. Analysis and Results

4.1. Changes in Curricula

Polish interviewees mentioned 164 different curricula changes that we grouped into four categories presented in Table 1. The third category deserves our special attention as it depicts changes forced by the university or national regulations. It includes adjustments that follow changes in the national regulation, so-called Polish Qualification Framework (PRK, pol. Polska Rama Kwalifikacji). The changes might be of different scope, e.g., concerning the whole module or only one part, and might be classified as: major or minor changes, big changes, small changes, various changes, and comprehensive changes (e.g., when the concept of the whole module is changing).

Table 1. Categories of changes reported by the KUE respondents.

Category	Description	Percentage of responses
Content of the module	content (in general), technological tools, simplification, nature of theses, projects	37.8%
Way of class organisation	presentation, tasks/examples, didactic methods, way of conducting classes, auxiliary materials, student assessment, boredom elimination, adaptation to the group, modification of e-learning courses	30.5%
Changes at the organizational level	Polish Qualification Framework (PRK), the concept of the subject, changes forced from above, association with other modules, syllabus (changes), adaptation to certification	16.5%
Literature		15.2%
Total		100.0%

At USN, there are three dimensions to curriculum change: module plan, literature (reading list), and lesson plan for individual lectures/teaching sessions. The module plan is the legal document guiding what students should learn. Changing it requires a formal process and approval by the Dean. The reading list is updated about three months before the module starts, and this is the individual teacher's responsibility. Finally, the teacher has a lesson plan with more detailed information about the content in each teaching session.

4.2. Motivation for Changes

Respondents mentioned 122 motivations for changes that we categorised based on various stakeholder perspectives: teachers, environment/business, university, students, global, and extraordinary (Table 2).

Table 2. Categories of motivation for changes reported by the KUE respondents.

Category	Description	Percentage of responses
Teacher perspective	self-development of the teacher, student welfare, teacher's profile, interactions with students, teaching evaluation, the evolution of teaching	37.7%
Environmental perspective	employers' needs, market trends, changes in technology, market needs, legal regulations, other module/subject university curricula, contact with graduates	26.8%
University perspective	study programme adjustment, demands of the authorities, technological environment, discussions	14.0%

	with peer teachers, enforced by teaching schedule	
Student perspective	student feedback, student needs	14.0%
Global environment perspective	international accreditations, certification, education system	3.5%
Extraordinary events	pandemic, other extraordinary events	2.3%
Demotivation	*teacher workload, lack of students' interest, time-consuming*	*1.6%*
Total		100.0%

At USN, curriculum change is motivated by a mix of student feedback, reflections on own teaching, feedback from and talks with industry, and any changes that might occur in the subject field. All respondents agree on the necessity of evolution in how modules are run and the need for gradual change over time to stay relevant.

4.3. Frequency of Changes

Polish interviewees mentioned 122 expressions for frequency of changes. The categories and associated subcategories are displayed in Table 3.

Table 3. Categories of changes frequency reported by the KUE respondents.

Category	Subcategory	Percentage of responses
At the beginning of the next edition of the module	each year, before each semester class starts, every six months, a year, at the end of the semester	38.5%
Daily	constantly, daily (in general), iterative approach, from month to month, every few weeks, from week to week	27.0%
At the discretion of the teacher	not immediately, I don't often change, once I remember, three-fold change, after technology change	12.3%
2-3 years	2-3 years, not less than once in 2 years	9.0%
4+ years	every few years, 4-5 years	6.6%
When developing a new module		3.3%
Lack of changes		3.3%
Total		100.0%

At USN, a major change in the subject content mostly comes when there is a major outside change. For example, one of the respondents mentioned a module in Adobe Flash that had to be changed "overnight" when Flash was retired.

5. Preliminary Framework for University Curricula Development

As a result of gathered data analysis, we propose a preliminary framework, named Curriculum Redesign and Engagement for Advancing Tech Teaching and Education (CREATE), to illustrate how the major stakeholders and their relationships shape the motivation and changes teachers make to the curriculum. Fig. 1 presents the framework that depicts the relationships among the stakeholders of university curricula development:

- Teachers, at various levels of their scientific/academic career,
- Students at different levels, i.e., undergraduate, graduate/master, Ph.D.,

- Alumni, former university students providing valuable retrospective insights,
- Academic community, teachers' contacts with other teachers and researchers,
- University, represented by organizational bodies at different organizational levels, e.g., depending on a university, Institutes, Faculties, Colleges, etc.,
- National institutions, e.g. the Ministry of Science and Education,
- International institutions, including European regulatory bodies and global accreditation organizations,
- Employers, at various levels, including domestic/local IT companies and start-ups, as well as multi-national corporations and global Big Tech companies,
- Technology, which is not a stakeholder per se, but capture technology-related solutions and trends developed by various companies and organizations.

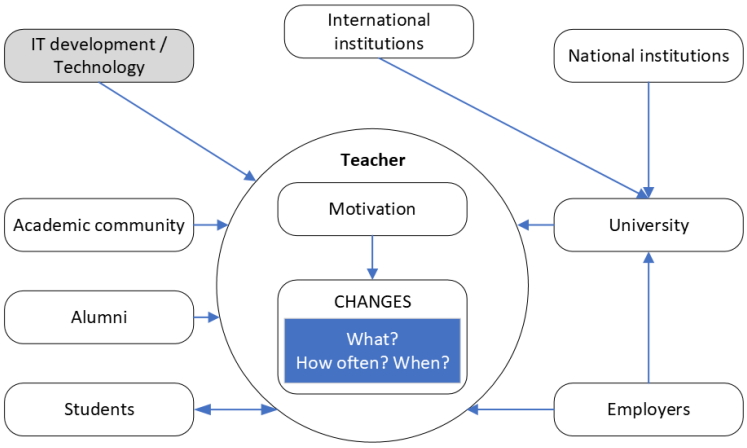

Fig. 1. The CREATE Framework: Stakeholders of University Curricula Development.

In our framework, the relationships are mainly unidirectional, except for the relation between teacher and students, which is bidirectional. In this relationship, on the one hand, teachers might change curricula based on the feedback from and interactions with students, which is an example of a relationship originating in students. On the other hand, teachers might diversify students' activities and reshape curricula having the student welfare in mind, which is an example of a relationship originating in the teacher.

The teacher is a central stakeholder in our model, influenced by other stakeholders at organizational and inter-organizational levels. At the organizational level, apart from the already mentioned students, the university is a key stakeholder impacting teachers in curricula development. This impact is being made through official university regulations and demands of authorities and also through less formal discussions with peer teachers.

External stakeholders influencing teachers in curricula development include graduates, the academic community, and employers. Graduates may influence curricula development through conversations with former teachers and retrospective evaluations of their past learning experiences. Such an impact might be treated as an example of a broader influence of employers on curricula development, where industry demands and market trends might impact teachers. The impact of the academic community boils down to teachers' research activities, participation in conferences, and observation of courses from other universities. Finally, in curricula development, teachers might be influenced by technology through technological progress and the availability of new technologies.

6. Discussion and Conclusions

Our framework includes similar stakeholders to those listed by Sinclair et al. [16] (universities, businesses-employers, governments-national institutions). However, we provide a bigger picture by suggesting several additional stakeholders at different levels. These include international institutions, the academic community, alumni, technology development, and teachers as the primary stakeholders responsible for implementing changes. Regarding the last aspect, our findings appear similar to the views of [9].

Nevertheless, our investigation and the resultant framework go beyond the proposition of various stakeholders and enrich the literature by suggesting relationships among the identified stakeholders. In a similar vein, our framework appears more detailed compared to the conceptual framework presented in [7] perceiving “university” as one unit (“black box”). In this respect, we distinguished the “Teacher” as the central stakeholder in our framework for curricula development, responsible for shaping the content of the subject.

One of the most critical relationships in our framework is an association between the job market represented by employers and the university. In such a relationship, we can distinguish the pressure put by the fast-changing job market on universities to prepare well-educated graduates able to meet the market demand. Such a relationship also illustrates some tensions between these two players in the educational system. On the one hand, we deal with a fast-changing job market, mostly private companies, demanding new knowledge and skills from their employees. On the other hand, we have mostly publicly owned universities operating under stiff regulations and organized around inert processes.

Based on our analysis, we can formulate several recommendations that should benefit stakeholders in the educational system. In particular, we might advise that the curriculum definition, which is formally stated in the university documents, should be flexible and open to some minor modifications. In this respect, we can mention the strategic level, which is the level of the formal curriculum definition, and the operational level, which boils down to the actual implementation of the strategic content. The proper balance between the strategic and operational levels appears to be one of the keys to both teachers' and students' satisfaction. It seems that the model solution is that at the strategic level, the curriculum should be defined in general terms that will allow to some changes at the operational level, i.e., the level of implementing and delivering the module to students. This operational level might reflect the changes in some technological, business, or legal aspects of the environment relevant to the module.

Monitoring alumni job careers would be beneficial to get more feedback about the job market requirements, providing an evaluation with the wisdom of hindsight. It should be noted that reflections provided by graduates some years after finishing studies are much more valuable than opinions of current students concerning a curriculum, as time is needed to gain some perspective and reflection on what is useful and what is not during the studies. To some extent, part-time students might be a good source of feedback in this regard as they usually already have some work experience, their opinions might be treated as an almost-ready-to-use solution to increase the flexibility of the educational ecosystem.

The interviews also revealed the need for inter-domain teams working on common curricula to reconcile multiple stakeholder interests. Studies usually encompass modules from different interrelated domains. Hence, it would be beneficial for the study to shape its curriculum during the discussion among all specialists representing all domains represented in the course. We can mention the concept of "balanced team composition," a well-known phenomenon in Information Systems and project management (e.g., [6], [10]). Such a solution would be especially beneficial for integrating curricula dealing with different domains or having a cross-domain nature.

The main limitation of our research is that it was conducted only in two universities, one in Poland and one in Norway. However, teachers might face similar challenges in other universities as national regulations influence all universities. Further, it is rather difficult to compare research outcomes in a formal way, as the number of conducted interviews is relatively small. In future work, we would like to examine in more detail the interrelationships between different stakeholders of university curricula development and investigate the possible influence on curricula shaping of some other factors, such as guidance from globally recognised institutions and generative artificial intelligence tools, e.g., ChatGPT.

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