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# Possibilities of Digitalization of the Qualification Thesis Topic Submission Process

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**Abstract**

The challenges associated with the process of awarding and processing qualification work can be traced both in the area of efforts to improve the quality of this specific process and in the area of supporting the digitisation of the study agenda in general. Given that the core processes at the university rely on highly skilled professionals, digitising processes is not as straightforward as it would be for more mechanical work. Although universities have a long tradition of organising work, they have not yet paid much attention to digitised processes.

For this reason, we developed and piloted a flexible electronic workflow for digitizing a selected process and tested it under real-life conditions, including the implementation of qualitative research. The results show the usefulness and adaptability of the proposed electronic workflow from the perspective of its users.

**Keywords:** digitization of processes, approval workflow, university qualification papers

## Introduction

The progress of digitisation of higher education in European countries has significantly accelerated the onset of the COVID-19 pandemic in the early 2020s. Such an intensive and massive transition to distance forms of education required an active digitization of the educational process, which took place in parallel with traditional pedagogical techniques (Ostapenko, 2022). The conducted research shows positive results (Kuzmina, 2020), where digitalization of educational processes improves relevant skills for the modern labor market and opens new horizons of knowledge and skills for the needs of the development of the information society. Thus, research on issues related to socio-cultural peda-

gogical impacts on the educational process remains relevant and open in the research space. In this context, several studies have also addressed the use of modern digital technologies as a means of reducing the costs associated with the implementation of educational activities. This is a serious topic, where, on the one hand, there is a prevalence of opinions pointing to the need to incur relatively high costs associated with the need to employ experts in this field (Alfarwan, 2019). Another group points to facts that emphasize the high added value of digitalization (Haneem, 2019). This is a relevant research problem here, which focuses on balancing the positives and negatives of implementing digitalization in the educational process.

As a consequence of digitisation, information systems have therefore increased in importance even in areas of education that are not usually considered to be primarily IT-oriented (Lagstedt, Lindstedt, Kauppinen, 2020). Universities are no exception, although some processes have a long and relatively unchanging tradition over several centuries. Although long traditions may be a barrier to digitizing these processes, there are other barriers as well. The core educational processes of universities rely heavily on highly technical work, and the proportion of purely mechanical tasks is rather minimal. In cases of digitisation of processes in higher education institutions, experts with strong opinions and expertise combined with a high degree of autonomy must be counted on.

That is why we have chosen one of the key processes of each university in our implementation, i.e. the process of assigning and elaborating the topic of the qualification paper. Although crucial for universities and their students, the process of specifying a qualification topic is not usually considered systematic. Rather, it is often seen as a repetition of a unique craft that is carried out using the best skills of the students and the will of the supervisors of these papers (Karunaratne, 2018).

Challenges associated with the process of assigning and processing qualification papers can be traced both in the area of efforts to improve the quality of this specific process and in the area of supporting the digitisation of the study agenda in general (Aghaee, 2015; Karunaratne, 2018; Klement, Kotouč, 2020). Currently, there are a number of systems for digitising the study agenda of higher education institutions that cover the area of assigning and processing qualification paper topics. One of these systems, which is used in more than 50 higher education institutions in the country, is the System of Study Agents (hereafter referred to as STAG), which has been investigated in terms of the interaction between the student and his/her supervisor in terms of the efficiency of processes (Keyte, Locher, 2004) related to the assignment and processing of qualification thesis topics. The scaling of these processes has also been examined in terms of its quality (Khalid, 2010) and resource management (Hansson, 2014; Haneem, 2019).

**Specifics of the development of information systems for the digitalization of processes at universities**

When digitizing processes and creating approval workflows, it is important to understand the capabilities and limitations of different IS development methods (ISDMs). Another important consideration is how ISDMs can be combined to enable the development of the desired processes and their workflows. From a management perspective, ISDM methods can be loosely divided into two methodological categories: plan-driven and change-driven methods (Moe et al. 2012). Plan-driven IS development methods were dominant in the late twentieth century, while change-driven ISDM has increased in popularity over the last two decades and is now the preferred method (Theocharis, Kuhrmann, Münch, Diebold, 2015; Lagstedt et al., 2020). In plan-driven IS development, planning and development are divided into separate phases. This is based on the assumption that every aspect of the development work, i.e. the goals and their required metrics, tasks and resources, can be planned thoroughly and in advance. Development begins immediately after the planning phase is completed. Plan-driven methods such as the waterfall method (Page, 2016) are a straightforward way to develop software, but there are many known problems (e.g., initial bugs are discovered late and are difficult and costly to resolve). It is assumed that no changes will occur during software development, and what is defined at the beginning will be implemented in later phases. Even if all the initial operating assumptions are formulated correctly, this does not guarantee the overall success of IS development as circumstances may change during the development process (Lagstedt et al., 2020).

In change-driven development, such as agile methods (Singh, 2019), the idea is that the whole IS is not planned at once, but planning and development are done in small steps. After each step, the situation is reassessed and necessary changes are made to the goals. Each step of development results in a new version of the IS. Even a change-driven approach is not seamless. Due to its nature, it is highly likely that radical, unplanned changes in the code will occur during development, causing inconsistencies in the software architecture. Because these inconsistencies are usually not resolved during the agile development step (called sprint), they become technical debt (Cunningham, 1992), causing further development and maintenance problems in the long run. Furthermore, if the user does not have a clear vision and priorities are constantly changing, or if there is no shared understanding of what is to be delivered, the scope of development becomes unclear and quality assurance challenging (Moe, Aurum, Dybå, 2012; Klement, Kotouč, 2020). Despite the relatively high success rate of projects delivered using agile methods, 61% are still not considered successful (Hastie, Wojewoda, 2015; Lagstedt et al., 2020).

One alternative is to use a hybrid approach, combining parts of plan-driven and change-driven development (Cobb, 2015). As no one method is suitable for all cases, it is important to constantly consider situations and select the appropriate method on a case-by-case basis (Harned, 2018).

**The process of assigning the topic of the qualification thesis**

The process of commissioning and producing a qualification thesis (Hansson, 2014) is often considered relatively straightforward, with the supervisor as the expert advising and the student producing the thesis according to the supervisor's instructions (Karunaratne, 2018). In practice, however, the process is more complex (Klement, Kotouč, 2020). For example, in our case, the process involved other professionals such as the department head (organising information sessions, checking students' thesis ideas and assigning supervisors), curriculum supervisors (overseeing the workload of supervisors and coordinators) and administrative staff (publishing the final thesis and recording assessments). The process of assigning and developing qualification thesis topics was selected for digitization based on the decision of the faculty management, the approval of the administration, the study programme guarantors, the student curia of the academic senate and the qualification thesis supervisors.

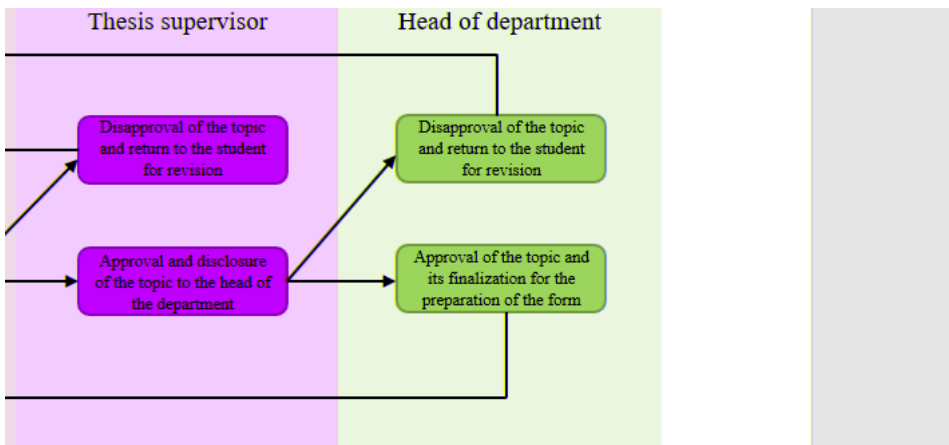


**Figure 1. Basic life cycle of a qualification topic**

In the initiation step (prior to 2022), the basic processes were described, and the process of specifying qualifying thesis topics proved to be one of the most complex. Various communication techniques and tools were used in the initial contact and between the student and the thesis supervisor, such as email, personal consultation, as well as various e-learning platforms (Moodle, MS Teams, Zoom, Big Blue Button, etc.), but these were not considered very useful when it

came to project-oriented personalized communication. However, the benefits of digitization, using a single system and a single approval workflow, were evident, and therefore work on the implementation of a digitized process was initiated in the period 2022–2023. The main requirements for this process were integration with existing data sources, automatic data transfer and that it be a modern platform supporting mobile devices.

The result was the introduction of a new digitised process for the submission and approval of qualification thesis topics, see Figure 1. The main advantages of digitising the process in this way are, for example, the automatic real-time monitoring of the progress of the work (deadlines and alerts, integrated automatic monitoring bar), notes and comments, visualisation of acceptances at each stage, integrated evaluation and a full log of the actions taken. One of the great advantages is the existence of different levels of reporting and different levels of transparency (according to user groups: 1 student, 2 work leaders, 3 department heads).

**Verification methodology**

In the research carried out to verify the usefulness of the implemented digitized process of assigning and approving qualification thesis topics, we relied on the four sources of data collection recommended by Sanchez (2013): documentation, archival records, participant observation and interviews. In the analysis, the main focus was on interviews; the other sources were considered complementary. The following research questions were formulated to validate the developed digital approval process:

Q1: What was the experience of the digital approval process?

Q2: How did users perceive the digitized process when it was implemented?

As the author of the present paper was responsible for the development and implementation of the digital process for the approval of qualification thesis topics, as well as for the operation of the STAG IS that supports it, there was thus a consistent approach to all documentation of the STAG module development (process models, notes, product backlogs, version histories, plans, emails and instructions). We also used STAG logs and registers as supporting data to understand the actual usage of the qualification work module under review. In addition, from the position of implementation guarantor, it was possible to manage the digitized process and make participant observations during the process.

The interviews followed the protocol developed by Dahlberg, Hokkanen and Newman (2016). Questions were presented to the interviewees either face-to-face or via video call.

A total of 29 respondents were interviewed. The respondents were selected on the basis of their above-average activity in various stages of the development and implementation of the qualification thesis topics module. Given that the

interviewees had extensive experience of the work and the roles they represented, the interviews can be described as expert (Bogner, Littig, Menz, 2009). The experts interviewed included study department staff (3), programme guarantors (2), thesis supervisors (8), department secretaries (4) and students (12).

The interview had two parts: the first part was about the digitisation process (O1) and the second part focused on the resulting process in STAG (O2). Of the total number of interviewees, 13 answered the first part and 27 answered the second part, with 11 being able to answer both parts.

## Results

The first part of the interview consisted of identifying the role of the interviewees and answering four open-ended questions. This also included the opportunity to provide open-ended comments. Responses were coded under each of the themes of the research questions (expectations, experiences and implementation of engagement). One code (service promise) was created based on the responses. In this section, 10 of the 13 respondents acted in one role, two in two roles and one in three roles. Areas of responsibility included administration (3), curriculum guarantee (2), and thesis supervision (8).

**Table 1. Summary of respondents' answers in the area of O1 – experience with digitisation processes**

| Question | Positive | Negative | Total |
|---|---|---|---|
| Meeting expectations | 10 | 3 | 13 |
| Deepening the experience | 12 | 7 | 19* |
| Implementation of engagement | 8 | 6 | 14* |
| Promise of service | 12 | 1 | 13 |

* accumulation of positive and negative reviews

In terms of experience, the majority of respondents (10 out of 13) set expectations early on, immediately after engaging with digital. From the administrative, managerial and guarantor perspectives expressed in the interviews, the following were considered particularly important: visibility of processes (at all levels of the organisation), automation of processes (automating parts of processes) and recording of statistics (getting rid of manual monitoring of supervisors and their resources). Managers and guarantors emphasised the change in communication, the usefulness of a single platform (fewer emails when communicating; materials are in the same place) and transparency (supervision is visible). Of the 13 respondents, 6 reported only positive experiences, 6 reported both positive and negative experiences, and 1 reported only negative experiences. Experiences with management, guarantee and supervision were more numerous and detailed, while experiences with administration and management were fewer and more general. Positive experiences were related to the characte-

ristics of the digitized process (extremely useful, agile model that makes good use of internal competencies and is generalizable to similar, well-designed development efforts), involvement (it was valuable to be able to participate and try things out, which also helps in commitment to the outcome), and influencing the outcome (user needs were considered).

Positive experiences of being involved in the digitisation process were noted by 7 respondents, and negative experiences (5 of 13) related to doubts about the extent of involvement (the pilot phase could have been longer and more people involved) and coping with incompleteness (some may have felt insecure about the changes). One respondent declared both negative and positive experiences of engagement (novelty of the solution and the need for change, the benefit of engaging in other activities). The service promise was viewed positively by 12 respondents (improved processes, motivation to continue working; positivity of the impact of the solution). It is worth noting that the respondent who stated that they had only had a negative experience still viewed the engagement itself as positive and found the associated work on the service promise useful.

**Table 2. Summary of respondents' answers in the area of O2 – perception of the digitalisation process**

| Question | Positive | Negative | Total |
|---|---|---|---|
| Process clarity | 24 | 3 | 27 |
| Process improvement | 20 | 7 | 27 |
| Process automation | 23 | 4 | 27 |
| Process usability | 19 | 8 | 27 |
| Process transparency | 18 | 29 | 27 |
| Process interactivity | 20 | 11 | 31* |
| Absence of process features | 9 | 18 | 27 |

* accumulation of positive and negative reviews

The most positive characteristics were the visual clarity and the holistic view of the process (24 responses, everything related to the process was in the same view). Twenty respondents cited improvements to the process either as a whole or as a specific detail or phase of the operation (fewer emails to send; assessment in the same system). The positive impact of automating the process was mentioned in twenty-three responses (topics were stored in the student's agenda system). Six respondents also cited the following characteristics: streamlining the process, guiding the process (forcing the user to take certain steps), easier communication (connecting the student and the supervisor), and ease of use.

There were 19 positive comments about the appearance and usability and the following adjectives were used: clear, simple, easy, logical, fast, light, easy to understand, and convenient. Six users also made negative comments. Five of them used the word "boring" when describing the appearance, and the terms

"old-fashioned" and "Windows-like" also appeared in the descriptions. Some respondents referred to specific features they did not like or found confusing. Eleven users wanted to suggest improvements they would like to see in the future. One feature that students would like to see added is a preview feature that would allow them to review the content of subsequent stages of the process. Work leaders would like to see the activities during the phases in more detail, especially in the final phase which contains many small steps. Eighteen users felt that the process has improved and is now more transparent (the student has to remember many things in the final stage of the process; tracking student processes was more difficult without STAG). Twenty respondents thought that the interaction between students and thesis supervisors had improved (interaction is now more organized), but ten respondents said there had been no change. One student pointed out a negative aspect (a student who does not use a university email address does not receive notification at the beginning of the process). One supervisor complained about the word processor (not on par with the bulk email editor).

Users cited the clarity of the digitised process and the fact that everything is in one place as reasons for the improved usability of the digitised process (11 responses). Five users stated that the overall manageability of the process had improved due to digitisation. There were individual views that the process was more manageable due to streamlining, enforced steps and record keeping. Four respondents also mentioned improved communication.

Of the negative features, most responses (18) culminated in the view that the system did not have a certain desired feature or did not work as the user expected. Seven respondents felt confusion at some point, which was usually related to a technical issue (do topics really transfer automatically and according to instructions?). However, only two users mentioned that the instructions were insufficient. Eleven respondents, including three students, identified some kind of resistance to change or to using STAG and its module for creating and approving thesis topics (many students still send emails). Nine users had some specific features in mind that they would like to see in a digitised process (text proofreading would be useful; group mail for students is needed).

**Reliability of research findings**

Interviews were conducted either face-to-face or via Big Blue Button (again, interviewees were able to monitor responses). Sessions were pre-arranged and took place in a quiet environment free from distractions. Data processing was carried out in Excel using standard content analysis techniques – i.e. coding and summarising. During the interviews, the questions appeared clear and the interviewees were able to answer fluently. Conceptual and construct validity was therefore at an appropriate level.

The empirical data used in this paper is based on interviews with a relatively small sample of individuals who are referred to as stakeholders due to their different roles and activities during the use of the digitisation process. Therefore, the interviews were considered expert interviews (Bogner et al., 2009) rather than standard research interviews. Given that full use of the Qualification Thesis Topic Approval module has only recently begun (early 2023), stakeholder interviews were limited to staff involved in the planning and trial use phase in the autumn of 2022. Students were selected randomly from STAG and from those who had either completed or were in the process of completing the assignment of Qualification Thesis Topics. Thus, they did not include all degree programs in the faculty, and therefore the results obtained are questionable because the sample consisted of rather pioneering users and may be slightly biased compared to the base population (all faculty staff and students). However, other available data, such as discussions and emails with a more representative, larger number of users, are consistent with the data from the research sample used.

**Conclusions**

Interview data, STAG protocols, documentation and observations confirmed that the digital process performed reasonably well in the development and approval of qualification thesis topics. The findings met the objectives set out for the digitised process: students felt they were listened to, the implemented digital process reduced the workload of thesis supervisors, was easy to use from the perspective of programme supervisors and departmental managers, and ensured "unification of activities" (see e.g. Davenport, 2010). The level of development of the digitised process was meaningful and therefore provides a suitable basis for the next steps in the digitisation of the curriculum. In addition, the implemented digitised process is visually clear, allowing for seamless control of all its functions and visualisation of the different stages of the development and approval of the qualification topic. This supports the understanding of the process and refers to the ease of use (Sarkar, 2007). The above feedback suggests that the process of entering and approving qualification thesis topics has improved, i.e. the implemented workflow is perceived as useful.

There is always room for improvement, as some students and thesis supervisors perceive the changing IS as confusing, hence more emphasis could be placed on planned development. In addition, some felt that the pilot validation was short and therefore feedback should be collected over a longer period of time and from a larger group of users. In addition, in some cases, users claimed to be following the delivered procedures, but analysis of their activities showed that this was not in fact the case. Interestingly, the implemented workflow seems to have created so-called "engaged change agents" (Lagstedt et al., 2020), alt-

hough this was not the observed goal. This effect should be investigated and further developed, which is also an intention for our further development and research work in this area.

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