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Student Experiences on Using Process-centric Thesis Management Tool

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Abstract. We are in the middle of rapid change in the fields of digitalization and automation. The Covid-19 pandemic accelerated the industry 4.0 work revolution by shifting people to a remote mode at work wherever it is possible. At the same time, the younger generations entering higher degree studies demand more personalized solutions in their learning paths. Haaga-Helia University of Applied Sciences has been developing a digitalized edtech tool Wihi to support students' personalized thesis process and help supervisors to monitor multiple thesis projects. Wihi represents new kind of process-centric philosophy where a student's learning process and a supervisor's process are combined. While used two academic years so far, it was time to review what has been achieved, and especially, how students perceive the support of the system and the approach it represents. To find that out, we conducted a survey with structured and open-ended questions. The target group was the students who were in the thesis writing process or had recently completed it. The results reveal that Wihi supports students' thesis project and enables personalized learning approach. However, Wihi's features are used in different efficacy and there are also some challenges to be taken into account in further development and research.

Keywords: Digitalization, Personalized Learning, Digitalized Teaching Processes, Thesis, Survey, Educational Technology.

1 Introduction

The world is constantly changing and one of the biggest drivers for the change is digitalization and automation, sometimes called industry 4.0 work revolution [1, 2]. Paradoxically, digitalization and automation are seen as one of the most effective tools to respond to the challenges and pressure coming from the change of world and work. Digitalization generates disruptive solutions, also forcing the most reluctant parties to react, and no industrial sector is safe from this [3, 4]. Education is not an exception [5].

However, this revolution of work is not only an organizational or ecosystem level change. The biggest changes and pressures are on individuals. Due the change of

work (industry 4.0), many old jobs vanish and some new, more challenging, ones are generated [2, 6, 7]; and individuals must learn new skills and competencies. Education must be able to answer all the time faster changes or new requirements. Thus, the need for a change in the education sector is even bigger than in other industry sectors: if education sector is not able to adapt to change quickly enough, all other sectors will suffer a lack of skilled workforce, and the whole society will run into difficulties [2].

Although the need for the change is understood, and lot of discussion is done, for example, about personalized learning, there are not much examples of a holistic approach to the change in teacher's work processes supporting personalized learning in changing environment and digitalization. This kind of support is especially important in thesis phase, where students are already integrating to work life.

In our previous study [8] we presented a new educational technology solution Wihi. In Wihi development, we saw it important to combine the needs of supervisors and students together and to develop a tool to support both user groups' processes. Wihi is a working platform that keeps record of each thesis process and gives an overview of all or selected processes. It contains all the conversation and files related to thesis projects. In addition, it is a project management tool for students allowing students to assign tasks for themselves. Supervisors can make notes for their own use.

Often, when new edtech solutions are developed, only teaching situation or student's learning process are taken into account, solutions are in their own silos and the teacher or supervisor processes including the tasks and responsibilities outside of classroom are neglected [5]. In Wihi development, we followed expert oriented digitalization (EXOD) approach [8] and developed a personalized thesis management system to inline students and supervisors processes. Thus, on one hand, it is a tool for teachers to supervise thesis processes, but on the other hand, it is a tool helping the thesis-writing students to organize their work in individual level. Thus, it is important to evaluate Wihi from both of these aspects. The organizational level digitalization and change process has been analysed earlier [8], and now it was seen important to study how Wihi's features were serving the thesis process from the students' perspective. In our previous study, we presented some preliminary observations of Wihi's usage [9], but now, after the system has been in use almost two academic years, it was possible to collect real usage data.

To find out how students have experienced the new system, we formulated the following questions:

RQ1: How students perceive Wihi's usefulness and usability?

RQ2: Which of the old practices, used in thesis process before the introduction of Wihi, are still in use?

To answer these questions, we conducted a survey for students who were doing their thesis or had just graduated in fall 2020.

2 Theoretical Background

From a student's perspective, a thesis is as an example of a problem-solving project. According to [10, 89] a learner constructs one's own understanding by selecting and

transforming information (past and present) in order to gain new personal knowledge and understanding. In the thesis process, students may even need technologies they have not met before.

Since teachers are familiar with the process, they may use new technologies only as a substitute for manual tasks, or they can take new digitalized processes in use [11]. As personalized learning requires the latter approach, it is important to evaluate the effects of students and teachers actions. Especially students in higher education institutes (HEI) are allowed, and required, to construct their own study paths, i.e. personalize their learning. A HEI itself defines the nature and scope of the thesis. The HEI sets, e.g., reporting standards, the format and gives the assessment criteria. Otherwise, a student has a lot of freedom to design and perform the project.

When education is considered from the student's point of view, motivation and self-directedness are easily emphasized, as well as the role of supervisor and the feedback and assessment system in use. However, the used IS (information system) has a great impact on the afore mentioned, and if the users do not perceive the IS useful and easy to use, it won't be used [12]. Thus, it is important that digital transformation in HEIs is done in a controlled manner.

2.1 The Digital Transformation in HEIs

There are several challenges to utilize digitalization effectively in HEIs. As [5] pointed out, many HEIs do not have a strategic vision how develop their business to fit digital age. Without strategic vision, there is no management commitment and different solutions are being tried in siloes, without coordination and mutual interaction [5]. Good practices are not shared, challenges are not discussed and no further steps are taken. Often, only digital quick fixes are sought and the wider role of digitalization across the institution is not understood [5].

It seems that the available edtech tools support this approach. A remarkable share of the solutions are intended for a very limited use and are mainly aimed at students, supporting a specific phase of specific pedagogy. If processes are mentioned, students' learning processes are emphasized. Teachers' or supervisors' processes, if considered at all, concentrate on teaching situation, that is, on how lectures should be organized and how ICT can support the teaching situation [see e.g. , 13]. Although teaching is in the core of teachers' work, teachers' process include other tasks not visible for student. To be successful in digitalization, these tasks should be supported as well [5].

Another challenge are the assumed capability needs in digitalization. Overall picture of teachers' processes is seldom emphasized when teachers' capability for digital change is discussed. For example, the TPACK model [14] highlights three different areas of expertise teachers need to have to make education digital transformation possible: technological, pedagogical and content knowledge. Although the knowledge areas pointed out are essential for digital change, the teaching processes must be understood as well. If lecture-centeredness is the prevailing approach in teacher capability discussion, the risk is that the tasks outside of lectures are neglected. Thus, each

teacher copes the situation according to their abilities, that is, processes are not harmonized and they include a lot of manual work.

In addition to lecture-centeredness in education processes discussion, most of the work related to analytics in the education has been on the actions and results of students [15–17]. Normally, the data are collected in the learning environment and analyzed to track the learning and the progress of the student [18, 19]. However, education can be analysed from study, learning, teaching and process points of views [20], and processes of all relevant stakeholders should be taken into account. Analysis should not focus only on student’s processes, but more holistic perspective is needed [20], and a strategic level vision for digital transformation is essential in that.

If there is no strategic level vision for digital transformation in HEI and if teachers’ situation as a whole is not understood, there is risk that the ISs used are in silos and do not support data collection in users’ daily actions [5, 21]. In these cases, wrongly designed IS not only causes extra work and produce insufficient data, but in the worst cases also reduces the autonomy of experts (teachers). This easily leads into the situation where an IS is not used, or it is used only ostensibly to fulfill the given orders [21].

Having no understanding about the changed situation, lack of trust in digital services, digital illiteracy and burden of culture are mentioned as main barriers to digital transformation of HEIs [5, 8]. One reason for limited discussion of teachers’ processes and the small number of systems supporting teaching processes might be that the teachers are considered as individual experts, which have quite a bit mechanical work but strong opinions and expertise combined with high autonomy [8]. Nonetheless, as [22] pointed out, it is possible to digitalize also the work of experts, and guidelines and recommendations for university processes digitalization have been studied as well [21, 23].

2.2 From Autoregulation to Self-directedness in Thesis Writing

Thesis is considered as a sample of the student’s learning, and often the independency also affects the evaluation of thesis. When planning, scheduling and progress of thesis writing is responsibility of the student, the IS supporting thesis writing must help students to manage their thesis writing process.

Self-regulation or autoregulation [see 24, p. 94], explains the mechanisms that regulate human behaviour. In the context of pedagogy, this can be formulated as self-directedness. According to Breed [25, p. 3], self-directed learning requires student to figure out the learning needs and strategies to learn in order to meet the goals. Breed continues that some other researchers, e.g. Guglielmino; Brockett and Hiemstra, put more weight on the learners’ characteristics.

During a thesis project, a student should schedule the project phases. The schedule cannot always be kept, but a student should still have a feeling that the project is under control. Otherwise, the feeling of failure may lead to anxiety and worsen the situation, possibly leading to halting the project and dropping out [see also 26].

2.3 Feedback and Assessment

Even if behavioural learning theories are mostly superseded by cognitive psychology and constructivism, the reinforcement appears in motivation theories [e.g. 27]. Immediate feedback is the most efficient. The challenge of the thesis is that the feedback is often directed to faults and deficits leading to demotivation if not to anxiety. Based on the feedback of graduating students [28], some students do not get constructive feedback or the feedback is given too late in the project's final stage.

Some students are highly independent with high self-esteem. Some may even get irritated if a supervisor is too keen on giving feedback [see also 27]. Illeris [29, p. 16] mentions mental resistance, which may block or distort learning. In a thesis work, a student may have already put all the effort into the report and feedback requiring major changes may be too much to deal with. The other extreme are the students who are so unsure about their decisions that they continuously want detailed feedback. Without the response from the supervisor, a student may halt the process. Therefore, it is important for a supervisor to manage the feedback and keep it at optimal level.

2.4 The Role of the Supervisor

Despite the Internet and modern libraries, there is still a need for traditional thesis tutoring in order to gain intellectual and cognitive growth [see 10, p. 14]. While this is easy for teachers used to interacting directly with the students, the systematic follow-up of every thesis project (with unique schedules) is challenging. Thesis supervisors need to use emails, spreadsheets and calendar applications to handle the situation.

One supervisor may have over 40 thesis in different phases to supervise at the same time. If no supporting IS is in use, communication is scattered in the supervisor's mailbox, with intermediate versions of thesis either as attachments or saved in supervisors' folders. In this kind of situation, certain (silent) students who might need help are easily forgotten. This may lead to delayed projects, anxiety or even to the students' dropping the project or their studies altogether. As a solution, all data should be kept in one database that can be accessed via a portal or user-tailored interface [21].

The roles of the thesis supervisor and the student resemble the apprenticeship where the knowledge and skills are transferred from a master (supervisor) to an apprentice (student) [10]. Kegan [30, p. 42-44] uses terms informative and transformative learning. In informative learning, only the knowledge changes, but in transformative learning, there is an awareness of methods on developing knowing. This requires interaction, and it is most efficient in contact situations.

3 Research Method

This research can be classified as a small-scale survey having quantitative approach. The data was collected in Haaga-Helia University of Applied Sciences (HH) via Webropol application, and the e-mail addresses of the students were retrieved from Wihi. The electronic form contained 18 questions, 16 structured and two open-ended (one about the key benefits in using Wihi and one about the additional features that

should be implemented). The questionnaire was bi-lingual (Finnish/English). As e.g. [31 p. 301-350] suggests, the form was designed for multiple devices. The survey was open between November 30 and December 14 of 2020. One reminder was sent (as suggested in [31 p. 301-350]) increasing N from 19 to 36.

The survey request was sent by e-mail to 695 bachelor students, who had recently completed or were about to complete the thesis. However, since the time window between completing the thesis and the graduation is very narrow, the ratio of graduated students was high in the sample. Consequently, the request did not reach all of the graduates because their HH e-mail addresses were expired. As an estimation, this cut out approximately 60 % of the requests. In addition, graduated students may feel that they have not any responsibility nor reason to answer. As a reference, HH students' current response ratio to the course feedback is between 10 to 15 % indicating general survey fatigue. The analysis of the data was done using SPSS statistical program. The answers to the open-ended questions were analysed by identifying their relevance to the research questions RQ1 and RQ2. From answers, representative ones are used as examples where applicable illustrating students' views as results are discussed.

4 Results

The findings are based on the answers of 36 thesis students. The majority of the students (N = 22) had already completed the process and for the rest (N = 14) the process was ongoing at the time of answering.

4.1 Perceived Usefulness and Usability (RQ1)

The usefulness was measured with a structured question “*Which of the following functions in Wihi have you used?*” having four preset choices. In addition, pedagogy related propositions and the two open-ended questions about the key benefits were related to usefulness and usability.

The structured question had “yes”, “no” and “no answer” choices for *comments*, *files*, *media files* and *tasks*. The *comments* feature offers messaging between the student and the supervisor so that all messages are in one platform under student's project. It was used by 22 (61 %) students while 10 (28 %) had not used it and 4 (11 %) did not reply. This reveals that one third of the communication bypasses Wihi or that there was no communication at all. Still, the feature was the second most often mentioned key benefit (“*all messaging with the supervisor is saved*”), although improvements were also proposed (“*make it easier to use and have a better nested messaging*”) and due to perceived difficulties in using the feature, one student commented about using alternative means (“*this is why we have used e-mail instead*”).

The *files* feature is used to keep all the thesis report versions, forms and other material in one place under the student's project. The feature was used by 29 (90 %) students. It was also the most often mentioned key benefit (“*an easy way to send files*”).

In comparison, the utilization of *media files* (other type of files than e.g. Word or pdf) and *tasks* was minimal. With the tasks feature, a student can set specified duties for him/her self and mark them done when completed. Tasks were used by less than 10 % of the students indicating very modest self-directedness towards utilization of new type of information and keeping the work systematically organized and scheduled. There were no requests for additional features apart from recordings (“*online recorded seminars*”). Instead, some comments on additional features requested more comprehensive instructions for Wihi (for example, “*overall information on where to find and what is*” and “*instructions on the use*”) and few comments noted little or no perceived benefit (“*I would have completed my thesis successfully without it*”).

A pedagogical goal of Wihi is to support personalized learning and make the process more understandable. This was measured by propositions a-g with scale 0-10 (Table 1). The best results were achieved in a) *The division of the thesis process in stages at Wihi, has increased my confidence to achieve the goal*. The average 5,5 partially supports a student’s self-esteem and increase in motivation. In addition, there were several comments about the benefit of division to stages (“*it did not feel so big when it was divided into smaller stages*”).

Table 1: Descriptive statistics of the pedagogical propositions of the survey (a-h, scale 0-10, high values are positive results whereas in f low values are wished).

Propositions	N	Min	Max	Mean	S. E. Mean	Std. Dev.
a) The division of the thesis process in stages at Wihi, has increased my confidence to achieve the goal.	30	0	9	5,50	,573	3,138
b) Wihi, as a tool for managing files and messaging, has improved to keep the focus in the thesis project	28	0	9	4,43	,607	3,214
c) Working in the Wihi platform has helped me to understand the core elements of the thesis, hence improved the overall comprehension.	28	0	9	4,29	,563	2,980
d) The Wihi scheduling and monitoring has helped me to achieve the intermediate goals.	28	0	9	4,68	,617	3,267
e) The Wihi scheduling and monitoring has increased my motivation.	26	0	10	4,35	,574	2,925
f) The Wihi scheduling and monitoring has caused me negative feelings of pressure.	22	0	8	2,86	,519	2,436
g) The interactive commentation between me and the supervisor in Wihi has helped to advance and complete the thesis.	26	0	9	4,31	,632	3,222
h) Meetings (face to face / phone / video) with the supervisor have helped to advance and complete the thesis.	15	3	10	6,93	,547	2,120

Proposition b) *Wihi, as a tool for managing files and messaging, has improved to keep the focus in the thesis project*. The average 4,4 is low to argue that the goal would have been reached, although the distribution is polarized meaning that some

students have benefited of the feature. Also, as seen earlier, managing documented (*files*) and messaging (*comments*) were seen as the key benefits in open questions.

Since Wihi is a tool for thesis project managing and the comprehension is more up to the materials elsewhere, the average 4,3 of proposition c) *Working in the Wihi platform has helped me to understand the core elements of the thesis, hence improved the overall comprehension* is understandable. The students did not expect this either, since there was only one comment asking for instructions on core elements of the thesis (*“instructions on the progress of the thesis”*). More was expected of d) *The Wihi scheduling and monitoring has helped me to achieve the intermediate goals*. There are three 5-credit phases in thesis project, assuming rewards during the project to motivate the students. Average 4,7 is a slight low although highest standard deviation indicates that opinions are scattered and some students have benefitted from the intermediate credits. This is supported by the open questions (*“intermediate goals”*).

Proposition e) *The Wihi scheduling and monitoring has increased my motivation* estimates if automatic monitoring can foster motivation to keep the schedule. In Wihi, the student sets the dates for project stages and Wihi indicates if dates are not met or no advancement has been detected in a certain period of time. Average 4,4 shows that there is no significant impact although some comments show that this is seen as a benefit (*“constant tracking of the progress made”*). In related variable f) *The Wihi scheduling and monitoring has caused me negative feelings of pressure*, low average was wanted and attained, since it was 2,9. There were no related comments.

Proposition g) *The interactive commentation between me and the supervisor in Wihi has helped to advance and complete the thesis* did not get high average, as it was 4,3. The distribution is polarized, indicated also in open questions, since the messaging (*comments*) was often mentioned as benefit, but also as a feature that could be improved. This may refer to the lack of perceived interactivity in messaging or that messaging took place in other media.

The opinions on usability were measured by two questions (Fig. 1) related to visual clarity and overall usability. The scale here was 4-10 (used in Finland and familiar to the students; it matches D-A scale approximately as follows: 4=F, 5=D, 6-7=C, 8-9=B, 10=A). The average in both was 7 which is satisfactory. There were also several negative comments about the appearance (for example, *“boring”* and *“scarce”*) and several suggestions for improving it or the usability (for example, *“more appealing looks”* and *“reminders featuring next planned events”*).

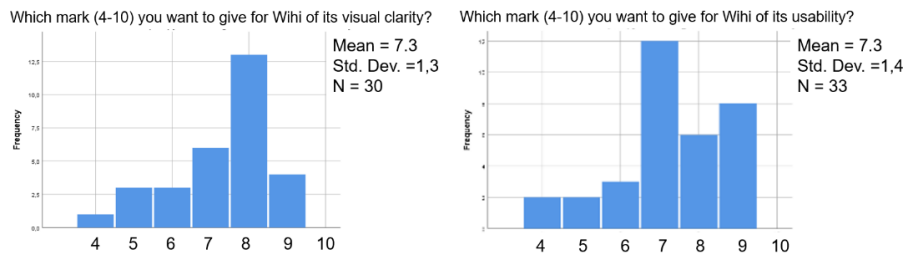


Figure 1: Which mark (4-10) you want to give for Wihi of its visual clarity? (left); Which mark (4-10) you want to give for Wihi of its usability? (right).

4.2 The Use of Old Practices (RQ2)

It was assumed that some old practices still exist due the resistance to change or because all features in Wihi have not yet been fully comprehended [see also 32]. This was measured with two structured questions “*Which of the following have you needed/used in your thesis process?*” and “*Meetings (face to face / phone / video) with the supervisor have helped to advance and complete the thesis*” (proposition h in Table 1).

The first of these structured questions had “yes”, “no” and “no answer” (=missing answer. i.e. “yes” or “no” not selected) choices for five preset options *email, phone, video meetings, face to face meetings* and *thesis workshops or camps*. *E-mail* had been used by 32 (89 %) students and only 4 (11 %) replied that they had not used e-mail. Although it may be a coincidence that the same number of students did not answer the earlier question about using *comments*, this emphasizes that the feature has not been fully understood. An important benefit of Wihi is that messaging between the student and the supervisor is in one place so that a student can find all the thesis-related messages from Wihi, instead of filtering them from e-mail. This feature is even more important for the supervisors, since one supervisor may have up to 40 ongoing thesis at a time.

Since Wihi does not have a chat or video meetings, it is understandable that 9 (25 %) had used *phone* and 28 (78 %) *video meetings* (Teams/Zoom/Skype) with their supervisor, especially taking into account Covid-19 preventing face-to-face meetings at the time of the survey. Still, because some students had started their thesis before Covid-19, 16 students (44 %) reported having had face-to-face meetings (consultation), and 9 (25 %) had joined thesis workshops or camps.

The second structured question was presented as a slider (0 = not at all, 10 = significantly). It is related to the live, phone and video meetings representing the traditional face-to-face meetings, since regardless of the introduction of Wihi, they remain as a pedagogical method. Although the numerus 15 is low partly due to the Covid-19, the average 6,9 tells that face-to-face contact cannot be ignored and there is still room for “analogue” techniques and human contact.

Related to the key benefits, there were also several comments illustrating that Wihi was not utilized to its full extend (for example, “*I did not use it that much*” and “*it was not actively used by the supervisor*”). This emphasises the importance of making the benefits (usefulness) clear to students and the importance of the supervisors’ example.

5 Discussions and Conclusions

The student thesis management system Wihi was developed for a helpful tool for thesis coordinators, thesis supervisors and students. The students are the largest and the fastest changing user group with the shortest usage time of the system. There are 2000 new students per year, each student using the system only for one semester.

Based on the answers of the survey, we can conclude as an answer to RQ1: *How students perceive Wihi’s usefulness and usability?*, that in general student are rather

pleased for the system. Even though some criticism was levelled at the dullness of the interface, the system was considered clear and reasonably usable. Because students are a constantly changing group of users with limited time and guiding resources, the interface has been deliberately kept scarce and its functionalities at a minimum. Against this background, the results are good. Wihi supports students' thesis project and enables personalized learning by helping students to plan and schedule their thesis project, giving a communication channel and increasing students' confidence to achieve their goals. However, as Wihi's features are used in variable efficacy, the results also point out the need for more guidance. It was found out that not all students have understood the features correctly. The guidance can be improved by embedding guidelines within Wihi, by external guidelines, guidance by supervisor or general guidance given by thesis coordinators. Based on the answers, there is need to improve all these in some level.

One measure for the success of a new IS, and the new process it supports, is how many old practices are still used after the implementation of the IS. If perceived usefulness and usability by the users is one side of the coin, the replacement of the old practices is another. This was explored in RQ2: *Which of the old practices, used in thesis process before the introduction of Wihi, are still in use?* Based on the answers, we can conclude that old practices are still used in parallel with Wihi. In some cases, it is understandable (or even encouraged). For example, due to the Covid-19 situation, video meetings and phone are obvious tools to synchronous communication between the student and the supervisor, especially since Wihi is not planned for synchronous (live) communication (originally, in the process, the synchronous communication was done in face-to-face meetings). Wihi was planned for asynchronous communication to substitute emails. It seems that this objective is not fully successful, since email is still rather widely used. After this finding, active measures have been taken to shift the conversations from email to Wihi. Further progress has been detected, but it seems that old practices vanish slowly.

The volatility of the student user group makes it difficult to have a system pleasing all, as 2000 new users per year is a challenge for any system. The features of the system, as well as the user interface must be kept as scarce as possible, and it seems that there Wihi has succeeded rather well. However, there is an identified need for more guidance, which is in line with the observations of the use of old practices, especially email, parallel to using Wihi. The students' use of the system is also unique compared, for example, to the supervisors who repeat the process with different students while individual student does a thesis once. Thus, it is crucial to provide support for the personalized process and based on the results, Wihi is a platform that already enables this very well and has even more underlying potential that to be realized when its capabilities are fully understood and used by both the students and their supervisors.

In future studies, it is good to note that the students are not using Wihi by themselves, but with close interaction and guidance from supervisors. Therefore, it is important to examine supervisors' use and experiences of Wihi as well: do they find the system useful, and do they require students to fully utilize it. In this study, we asked students opinions and experiences, but in order to get more comprehensive picture, it is important to also examine the real usage data from the Wihi system logs.

We see that the findings of this study are not important only for the further development of Wihi and the guidance supporting it, but also for the development of other similar kind of IS with high user turnover, which is rather typical situation in education. Instead of more common lecture-centric approach, the developed thesis management system, Wihi, represents a new kind of process-centric approach to education IS, and as such, has shown to be a useful tool for all parties. We see that these results are important to be considered when other process-centric solutions are developed. The personalized needs of users must be understood and supported in different situations and balanced between simplicity and usefulness.

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