COVID-19-Related Challenges in Business Information Systems Education: Experiences from Slovenia

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Abstract. Universities have encountered numerous difficulties and challenges during the COVID-19 pandemic. They used various approaches to deal with these challenges. Unfortunately, these experiences are not widely discussed. Therefore, this study provides preliminary insights on how the business information systems department at the Faculty of Organizational Sciences, University of Maribor managed to overcome different challenges and executed the study process completely online in the COVID-19 pandemic. Experiences of conducting several courses at the bachelor and master level are reported in the paper. We also provide some suggestions on how to overcome specific challenges faced by students and lecturers. In the future, we wish to conduct a multiple case study including the viewpoints of lecturers, support staff, and students.

Keywords: Business information systems · Study process · Digitalization · COVID-19 pandemic

1 Introduction

The higher education system has undergone numerous changes over the years [1]. Online courses, more diverse and international communities, and more study options are just a few examples of the changes taking place at universities worldwide. Among the most prominent drivers behind these changes has been information and communication technology [2], which also proved useful in the COVID-19 pandemic [3].

The COVID-19 disease broke out in China in December 2019. In Slovenia, the first infected person was detected on March 4, 2020, and the disease began to spread across the country. On March 12, 2020, the pandemic was officially declared and the government began to implement new measures to contain the pandemic, which, as elsewhere in the world, drastically limited public life in the country. The government withdrew the declaration of a pandemic on 31 May 2020. The first wave of the

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pandemic in Slovenia lasted 12 weeks. The second wave of the pandemic followed in the fall, when the numbers of infected and dead began to rise sharply.

During the COVID-19 pandemic universities had to conduct lectures and tutorials online, as all educational institutions were closed. Numerous difficulties and challenges have been encountered in this process. There are also various approaches used by faculties to deal with these challenges. Unfortunately, these experiences are not widely discussed. Therefore, to better deal with the difficulties and challenges presented by the COVID-19 pandemic, it is important to share best practices and learn from other experiences.

In this study, the focus is on business information systems education in Slovenia and how the Faculty of Organizational Sciences, University of Maribor managed to overcome different challenges and executed the study process completely online in the COVID-19 pandemic.

2 Materials and Methods

This descriptive study reports the experiences from the Faculty of Organizational Sciences, University of Maribor during the COVID-19 pandemic. This faculty was chosen because the authors are part of the Information Systems department and were involved in the study process during the mentioned period. This department consists of 13 members that cover different fields of information systems and are lecturing different courses in the undergraduate and master programme of Organization and management of information systems (OMIS) study programme. The authors are involved in several courses, for example, Business Model Design and Business Information Systems, Digital Business, Decision Theory, and Data mining to name a few.

Each author provided experiences on the digitalization of teaching and learning during the COVID-19 pandemic. These insights were then combined by one author and then reviewed by all of them. The revised version of combined insights is provided in the following section.

3 Findings

Traditionally, the faculty's study programmes are all accredited as a blended learning, combining in class and online lectures and tutorials. For this purpose, we used Moodle as a common learning platform for all courses for many years. After the pandemic was declared, teaching was switched to MS Teams. As this happened virtually overnight, without any training for faculty and students' different problems occurred, especially concerning the student's access to different program solutions, students' collaboration, and lack of material appropriate for online classrooms. The problems and how it was dealt with are presented in the following subsections. First, the experiences at the undergraduate level are presented, followed by the presentation of the experiences at the master level.

3.1 Undergraduate Level Experiences

At the undergraduate level students become acquainted with different work environments and problem-solving practices related to the development, operation, and maintenance of information systems.

In this section we report observations from three courses in the OMIS study program. The two of them - Business Model Design and Business Information Systems - are taught in the second year and Digital Business in the third year. All three courses are mandatory for the students of the OMIS program. In all three courses, we use teamwork, problem-based learning, and various business modelling tools. There were 12 students enrolled in each of the first two courses, and 25 students in the third course.

In the first course we use a simple business case where students are divided into groups and evaluate different problems and learn different tools while applying them in different phases of Soft System Methodology. Later, they approach a complex case developed based on a real environment - a small manufacturing enterprise. Normally, we often use a blackboard, large posters, markers in different colors, and "post-it" papers during class. Student groups used separate parts of classrooms for discussing and collaborating. This was much more difficult with the MS teams. Sometimes a simple drawing to show how to use a particular tool took a lot of effort to draw using MS Visio or another tool, even if the templates were used. For students to collaborate, we prepared channels in MS Teams, one for each group. However, they used these channels only during lectures. For collaboration on their assignments outside lectures, they used Discord. During the lectures, it was more difficult to engage students in conversation, because it was the first time we met in a virtual environment. They were shy and only participated in the conversation when invited and called by name.

After this course, we met again with the same group of students in the Business Information Systems course. There was less teamwork in the lectures and we did not use any tools, because they were already familiar with the tools from the previous course and they needed these skills only for completing their seminar work later in the exercises. We focused more on the technological perspectives of information systems and discussing the different cases. Student engagement was the same as in the previous course. Only a few students participated in the discussion. The others participated only when called upon by the lecturer.

The Digital Business course is taught in the third, final year of the undergraduate program. We met with this group of students in person before the pandemic. However, half of the students were from the program Business Engineering. And it was with these students that we met for the first time. Surprisingly, these students were also more engaged, even though they were not familiar with the content of Information Systems or Digital Business. This course was more dynamic, with more discussions. This course looks for the innovation potential of digital business models. Students have to apply all the knowledge, skills, and tools they know from previous courses. The result of their assignment and exam must be an innovative digital business model. For this purpose, we use design thinking to stimulate the students in the innovation process. They also presented their ideas to other peers during the course and we had several facilitated discussions as well as brainstorming sessions. In the end, students provided new ideas that were elaborated according to the syllabus.

More technological problems occurred during the tutorials, where students are working with different program solutions (e.g. SAP, Datalab Pantheon X). Before the COVID-19 pandemic access to all the program solutions was provided through computers located in the computer classrooms. As such, students did not need to install program solutions by themselves on their computers. When they needed to install program solutions themselves, many of them had problems because of the different hardware equipment, operating systems, and other settings they are using. When we managed to overcome these first barriers we were able to proceed with tutorials. The next problem that occurred, was related to very slow progress through the assignments. For example, the majority of students did not have an additional screen that would enable them to more easily follow the tutor instructions. Furthermore, some students had issues with the microphone and they reported problems by writing them into chat, which further hindered the progress. To proceed more quickly, tutors had additional sessions with those students who had problems. As the tutors' overload was detected this was just a temporary solution.

3.2 Master Level Experiences

At the master level students develop research, technical, analytical, communication and management (managerial) competencies that enable them to lead effective groups and manage business activities through information and communication technology.

In this section we report educational experiences from two courses on the OMIS program: Decision theory and Data mining. The lecturer was using a PC with two monitors, audio-video equipment for communication, and a graphic tablet (Wacom Cintiq 16). During both courses several programs were used, mostly open source, fully available for students (i.e. Orange data mining, Silver decisions, DEXi, etc.).

The decision theory is the first-year obligatory course for the OMIS students and an elective course for the students of the Enterprise engineering programme. Data mining course is an elective course for both the IS and enterprise engineering programmes in the second year (fourth semester) of master level studies. Usually, in the first year of master studies most students (80%) previously finished the bachelors studies of one of the Faculty of Organizational Sciences programmes. The remaining students are from other faculties and fields of studies (i.e. economics, social sciences, computer science, mathematics, etc.). There are usually some international students enrolled as well. There were 29 students enrolled in this course. This is an educational challenge in itself. Students have different previous knowledge, different levels of understanding of complex management problems, they often have no real-life experiences, and during the Decision theory course the lecturer must bring some of those real-life ideas of complexity to them. In previous years we have developed business simulators to support teaching about complex management problems [4]. The experiments that we have conducted from 2003 to 2006 showed that group supported simulation based learning contributes to a better understanding of the management problems and support learning about decision-making [5]. However, we could not use the business simulator in the online environment, because of the lack of IT support. Also, in the usual classroom environment the lecturer can use the blackboard to present the methods and techniques of decision modelling. The graphic tablet can somewhat replace the

blackboard, but this means that the lecturer is working on at least two screens. At the beginning of the course the students were a bit shy, but by the end they started to communicate more freely. They were purposively assigned into working groups, matching those who previously finished the Faculty of Organizational Sciences with those that came from other faculties.

The data mining course is different in the way that the group is smaller (up to 15 students), and by the fourth semester they have already known each other and have worked together before. Based on our experiences from the first wave of the pandemic, we have adjusted the lectures so that the lecturer used the Orange data mining software, while explaining the theory behind the methods and algorithms. This way, the students were more focused on the topic, there was more feedback seeking behaviour present and they were readier for the tutorials and independent work that followed the lectures. However, not all the students have two screens that would enable following lectures and simultaneously working in Orange. The students sought feedback more often compared to the first year's students. There was almost 100% attendance at the lectures, and all the students passed the exam on the first attempt, which was not the case at the Decision Theory course.

When tutorials took place, we encountered a lower level of productivity among students. Although more students were able to attend tutorials, some of them seem to only partly follow them, as they attended them during their work or other obligations. Thus, they were not able to fully focus on assignments and actively participate in the discussion. Consequently, we noticed a decrease in the quality of the submitted assignments.

4 Discussion and Conclusion

During the two waves of the COVID-19 pandemic, we have encountered different challenges. Some of them were quickly solved, while some remain even after the second wave of the COVID-19 pandemic. We did not notice essential differences between the experiences at undergraduate and master levels, but we can make some general conclusions based on our observations.

We noticed that many problems related to technological issues were resolved to the extent that the majority of our students can work in the learning environments that are required for each course. Unfortunately, the internet connection and technical equipment issues that students are facing [6] cannot be resolved by the faculty. Therefore, it is important to inform students before the course, what kind of technological equipment they will need to complete it.

Switching from traditional to computer-based learning/teaching is another problem that we noticed. In the first wave, we encountered difficulties to adapt from both sides, teachers, and students, but in the second wave mostly by students in the first year of undergraduate and master studies. We relate this adaptability struggle to unique circumstances, as our students were not able to meet in person at the beginning of the student year. Furthermore, lack of computer literacy prevented these students to manage their assignments and courseware provided [7]. To overcome this problem, the

faculty should offer their students (at least to the first-year students) basic courses in computer literacy.

Teachers have also struggled to motivate students at times. As some of the approaches did not prove successful we tried new ways, including offering them extra credit, adjusting the expectations, and laying out estimated completion times for each assignment. We also tried to motivate them by setting a collaborative environment [8]. This approach proved to be more effective in smaller groups where students already knew each other. In contrast, the larger groups that had never met in person were more difficult to involve in conversation with the teachers and among students.

Overall, even though substantial efforts were made by faculty to implement the distance study process, the disruption caused by the COVID-19 pandemic will have a long-lasting effect. Based on these experiences, we can expect in the future, a variety of new, more hybrid, and flexible teaching approaches that will motivate students to learn and help the teacher to better deal with situations, such as the COVID-19 pandemic [9].

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