Digital University: A Comparative Study in COVID-19 Times - Investigating the Impact of the Pandemic on the Acceptance of e-learning, Distance Learning, and Distance Teaching

This paper explores a comparative study on the Digitalization in Teaching conducted by the FH Wien der WKW (FHW) at the very beginning of the pandemic, with a follow-up one year later, after the complete changeover to distance learning. The study investigated behaviour and preferences of students and teaching staff as linked to their experience with digital tools both initially and after that year. The results were compared to the results of similar studies, focusing on answering the question about the impact of digital education on the acceptance of the digital tools and processes. This paper presents the findings of the FHW study examining the acceptance or rejection of e-learning by students and teaching staff by exploring their needs, questions, and requests. The research uses acceptance theory in its theoretical underpinnings. Its methodology consists of a quantitative survey of students and teaching staff, as well as the review of studies on related topics. The outcome of this study shows that, after a year of being forced to work with digital tools, attitudes among students and teaching staff generally became more accepting and shifts in their needs and requests could be observed.

Keywords: distance learning, digital tools, post-secondary education, e-learning, acceptance

Introduction

The COVID-19 pandemic, the most profound health crisis of the past hundred years, has been with us for about two years. The effects of this crisis have changed the ways in which we live, affecting all aspects of our lives. No other phenomenon in recent years has so fundamentally shaken our societies, nor to spread across the world at such speed (Skillsoft 2020).

The specific research area of this paper is the education sector, which was particularly affected by the imposition of measures enforcing social distancing and resulting in the closure of the majority of higher education institutions (Al-Kumaim et al., 2021, Holzer et al., 2021, Taga et al., 2020, Mohamed et al., 2020). The sudden closure of many educational institutions created challenges for both students and university staff. During this time, many educational institutions surveyed their students and employees on the impact of the sudden changes (Arndt et al. 2020, Pausits et al. 2021). Generally speaking, even those educational institutes that were already familiar with digital educational tools and distance learning were caught off-guard by the pandemic and the measures enacted to control it (Berghoff et al. 2021; Marczuk et al. 2021). While scholars acknowledge that the concept of online learning is not new, they also recognise that the digitalization of higher education accelerated dramatically
during the pandemic (Hargitai et al., 2021, Al-Kumaim et al., 2021, Kreulich et al., 2020).

Vienna’s University of Applied Sciences for Management and Communication – FHWien der WKW – is a rather small Austrian university with approximately 3,000 students spread across 10 Bachelor and 8 Master programs. The implementation of pandemic mitigation measures triggered a digitalization push throughout FHW’s teaching and learning activities, with the rapid deployment of digital tools and methods across a wide range of course types. Such changes have fundamentally changed the way online teaching is approached by universities, where digital skills are in greater demand than ever (Farnell et al., 2021, Berghoff et al., 2021, Kreulich et al., 2020). While the trend towards digitalization in higher education is nothing new – also at the FHW, which has long embraced digitalization in teaching – the novel conditions of 2020 and 2021 necessitated a faster and wider implementation than many had previously expected (Kreulich et al., 2020).

“Pre-pandemic” efforts towards digitalization in teaching were constantly surrounded by concerns about effects on the quality of teaching and about the acceptance of the tools (Söbke/Reichelt 2016). At the same time, the introduction of digital/virtual distance learning is recognized as bringing advantages, such as the promotion of individual learning, independent of time and space, as well as greater flexibility during studies through video conferencing, interactive exercises, streaming, and online learning platforms (Marczuk et al., 2021, Berghoff et al., 2021, Kreulich et al., 2020). Given recent upheavals and arguments on each side of the equation, this is an opportune moment to investigate how students and faculty view these developments, and how they deal with the digitalization and virtualization of teaching after more than a year of first-hand experience.

This article is based on studies conducted by a team of experts in the digitalization of communication at FHW, who have been investigating digital trends in higher education since 2019. This research project, funded by the city of Vienna, focuses on digital communication trends in higher education and developments in digital communication studies. Since the outbreak of COVID-19 in Austria during March 2020, the project has expanded its research interest to include students’ and lecturers’ experiences during the pandemic. Accordingly, four surveys have been conducted so far, with two targeted at each group: students and lecturers. This study includes four waves of data collection, from Spring 2020 to Spring 2021.

This longitudinal data on attitudes and experiences, collected during a period of substantial regulatory and institutional change, enables exploration of the acceptability of digital teaching in light of the changes brought about by social-distancing measures. Thus, the guiding research question addressed here is:

*How did the sudden shift to online education during the COVID-19 pandemic affect students’ and educators’ acceptance of digitalization in Austrian post-secondary education?*
The COVID-19 pandemic can be considered as an exceptional set of circumstances, which, in many cases, forced the rapid transition to e-learning, distance learning, and distance teaching. In this light, results of the aforementioned surveys into students’ and lecturers’ acceptance of digital teaching and learning can be understood as short-term consequences (Farnell et al., 2021). These factors notwithstanding, the longitudinal analysis of this data by the Competence Team for the Digitalisation of Communication can provide important lessons for improving the overall online learning experience for all parties involved in higher education (Marczuk et al., 2021, Walwyn, 2020).

This paper is structured in the following format: After this introduction the next section presents a short literature review and the theoretical framework of the research question. Section 3 focuses on the methodology and is followed by the results section, in which the empirical findings are explained, and the last section concludes the study.

**Literature Review**

The changes caused by the COVID-19 pandemic made it necessary for universities to regard digitalization as a strategically relevant topic, with many forced to implement a rapid transition to virtual teaching and learning in early 2020. During this adaptation to e-learning, and despite the extra workload implied, universities also seemed to increasingly launch surveys related to the digitalization process (Arndt et al. 2020). In the final report of the research project BRIDGING, Arndt et al. (2020) question the extent to which digitalization influences traditional transfer strategies for the development and dissemination of concepts and content in higher education. Accordingly, the research team conducted a supplementary qualitative study of internal surveys of teachers and students at German universities carried out during the summer semester of 2020. Likewise, the report “Distance Learning at Austrian Universities and Colleges in the Summer Semester 2020 and Winter Semester 2020/21” (Pausits et al. 2021) attempts to bundle and systematize the research work of Austrian universities into “distance education” during 2020. The following main results of these two studies have substantially informed the current research:

The content analysis by Arndt et al. (2020) of surveys related to digitalization within universities identified 13 areas of relevance: (a) workload, (b) life situation, (c) progress through studies, (d) examinations and forms of assessment, (e) learning progress and organization, (f) communication and interaction, (g) previous experience, (h) media-technical and didactical competences, (i) technical equipment, (j) technical infrastructure and tools, (k) virtual teaching and learning scenarios, (l) support and support needs, and, finally, (m) evaluation of the change process. The FHW surveys on which this paper is based focused particularly on areas (a), (b), (c), (h), (e), (h), (i), (j), (k), and (l). For the purposes of this paper, however, areas (a), (b), (h), (j), and (k) are of particular relevance and a short summary of Arndt et al.’s results in these
areas is presented below to facilitate comprehension of the similarities and differences between the FHW study and other related studies:

Ad (a) workload: Arndt et al.’s research stated that the workload was considered by the majority of both students and instructors to be (significantly) higher compared to face-to-face semesters – as a rule, more so by teachers than students.

Ad (b) life situation: Particularly the lack of workplaces for concentrated work and learning, financial burdens, and psychological stress can make learning and teaching more difficult. These may also be reasons for the often-expressed desire for physical presence in the sense of reopening learning spaces.

Ad (h) media-technical and didactical competences: Both teachers and students reported an increase in competence and saw this as creating opportunities for virtual teaching in coming semesters. In addition to the competence from a technical perspective, also the improvement of didactical competencies comes here into focus.

Ad (j) technical infrastructure and tools: The majority of teachers use learning management systems and video conferencing systems, primarily Zoom, on account of its high performance. Differentiation between knowledge and ability proves to be critical with respect to infrastructure and tools.

Ad (k) virtual teaching and learning scenarios: As students consider exchanges with teachers as important, they desire more than just self-learning materials. Combinations of asynchronous and synchronous teaching and learning scenarios meet the different needs and desires of both instructors and students. The designing of virtual teaching and learning scenarios, and particularly maintaining communication and interaction, generated a high workload for lecturers and various support staff actors at the universities both before and during the 2020 summer semester. Meanwhile, however, they adapted their offers to meet the needs of students and teachers.

Pausits et al. (2021) came to the conclusion that successful conversion to distance learning required of lecturers the following competencies:

(a) skilled handling of Internet-supported teaching technologies, such as the operation of video conferencing systems and learning management systems (media informatics),
(b) knowledge of possibilities for the methodological-didactic design of courses in distance learning (media didactics),
(c) knowledge about the design of digital learning resources, such as learning videos (media design), and
(d) independent management of their full scope of professional activities, including exchanges with colleagues for research activities, from their homes with the help of Internet technology.

Regarding the results for universities students, Pausits et al. (2021) concluded that the initial surveys paint a positive picture of universities’ rapid responses in crisis mode, but at the same time list some key challenges that
have become ever more prominent as the pandemic has progressed. These are related to:

(a) a lack of physical learning spaces,
(b) a lack of social contact with colleagues (Gabriel/Pecher, 2020; Lehner/Sohm, 2021; Schwab et al., 2020; Pausits et al., 2021; Meyer/Mara, 2020; Weinberger, 2020),
(c) less enjoyment of studies conducted through individual learning (Schwab et al., 2020),
(d) limited possibilities for group work (Gabriel/Pecher, 2020; Lehner/Sohm, 2021, Schwab et al., 2020),
(e) increased difficulties in communication with individual teachers (Schwab et al., 2020; Pausits et al., 2021; Ledermüller et al., 2020),
(f) high workloads in distance learning resulting from an underestimation of the workload by instructors (Schwab et al., 2020; Weinberger, 2020; Ledermüller et al., 2020).

The reviews by Arndt et al. and Pausits et al. expose a raft of important considerations that helped to inform the current study, as well as revealing common experiences at other universities, against which the FHW data can be benchmarked. First, two key aspects of the research question are defined in detail in the sections below: 1) distance learning and distance teaching, which are of equal significant here, as the main survey addresses the challenges and needs of both students and teachers; and 2) the concept of acceptance, which we operationalize by drawing on the theoretical foundations of acceptance research. A further important aspect is the context of the study, which was conducted with students and lecturers of the FHW, who experienced the pandemic-related changes in a common context. An explanation of this context is integrated in the following sections to increase the validity of the comparative analysis by setting the data within a realistic framework, while demographic data on the study participants are presented in the methodology section.

Distance Learning and Distance Teaching

Distance Education is nothing new: already in the 19th century distance learning courses were offered to soldiers (Kentnor 2015), while institutions made course content available to students for the purpose of self-study. Some of the most defining characteristics are the physical separation of teacher and learner, learning in the context of (yet not within) an educational institution, and the use of communication media such as radio, television, mail, internet, etc. in teaching (Fidalgo et al. 2020).

In Germany, the term “distance education” is defined in the 1977 Distance Education Protection Act as the transmission of knowledge and skills on a contractual basis, in which the teacher and the student are exclusively or
predominantly physically separated, and the teacher or their representative monitors the learning success of the students (FernUSG § 1 Abs., 1976).

With the advent of the Internet as a knowledge exchange platform providing possibilities for online data transfer, a previously unimaginable variety of distance education methods and tools has emerged. “Distance education was based on the premise that education was possible without the face-to-face interaction between the student and teacher. [...] Today, with the advancements in communications technology and the connectivity of computers and the Internet, distance education is commonplace.” (Kentnor 2015)

Recent developments in communications technologies have increased usage of the term “distance learning”, placing it in close relation to e-learning, virtual learning, or online learning. The FHW uses the potentials of e-learning to better address individual needs and to achieve a wider reach of teaching content. Digital infrastructures enable, among other things, asynchronous teaching, educational games, the creation of discussion forums, and synchronous virtual contact between students and teachers. Digital teaching methods thus offer extraordinary flexibility in designing learning processes and should therefore provide for improved learning motivation among students (Reiss/Steffens 2010).

Before the year 2020, the FHW was not interested in radically replacing traditional learning content with virtual content, but rather in enhancing it by blending real and virtual learning offerings. The terms “augmented learning” and “blended learning” accurately express FHW’s original intention, yet this intention changed significantly when pandemic mitigation measures forced a complete change to distance learning in a very short time period. The FHW used this as an opportunity to learn more about the possibilities for digital design in teaching as well as to better understand the acceptance of distance learning by students and teachers, given the circumstances.

Despite being two sides of the same coin, this article distinguishes between distance learning and distance teaching in order to precisely address the challenges that are experienced differently by students and teachers in distance education.

Acceptance Definitions

In discussing the acceptance of digital teaching, we apply the term as defined by Simon (2001) with respect to the acceptance of innovations: Acceptance stands in opposition to the term rejection and denotes the positive acceptance decision of an innovation by the users. The central elements of acceptance research are (a) the acceptance concept (What does acceptance of an innovation mean?), (b) the users (who has to accept an innovation and how?) as well as (c) the innovation (what is to be accepted?). (Simon 2001)

Attitudinal acceptance (Müller/Müller 1986) comprises both affective (emotional) and cognitive (rational) components. The affective component considers motivational-emotional states associated with the innovation. The
cognitive component weighs the costs and benefits of an innovation, taking into account personal context. Attitudinal acceptance by users is not directly observable. Behavioral acceptance (Müller/Müller 1986) extends the acceptance concept by an activity aspect. Behavioral acceptance is spoken of when innovations are accepted in the form of an observable behavior, such as use (Simon 2001).

Acceptance research also investigates the reasons for the acceptance of technological innovations with the aim of identifying and counteracting, undesirable developments as early as possible (Schlohmann 2012). The research interest of this article, the digitalized teaching program of the FHW, is considered as the innovative "product" and is examined according to its acceptance by students and teachers. Because the digitalized educational program relies on technological implementation and technical skills, the Technology Acceptance Model (TAM) is adopted as the reference model for our analysis.

The TAM aims to describe the motivational processes involved in using technological systems. It postulates that the characteristics of the system determine the degree of use by individuals and presents the relevant determinants of acceptance. The TAM assumes that the user’s attitude toward the system is an important determinant of the decision to actually use it (Schlohmann 2012). According to Davis et al. (1989), the developer of the model, perceived usefulness and perceived ease of use are the key determinants of attitude toward technological systems. In addition, perceived ease of use influences perceived usefulness (Schlohmann 2012).

The TAM offers tools to observe users’ satisfaction with their experience with new technologies. In a study about the contribution of technology acceptance to learner satisfaction in distance education, Ilgaz/Askar (2013) showed that students who perceived online learning systems as easy to use and useful for their learning were more satisfied with distance education, as were students who were able to develop a sense of community. Perceived usefulness was found to explain 45% of the variance in satisfaction and to have the highest predictive power. The researchers further determined that students in undergraduate degrees are more positive about distance education than students in higher degrees (Ilgaz/Askar 2013).

Methodology

This paper examines the acceptance of e-learning by students and teaching staff by exploring their needs, questions, and requests. The research uses acceptance theory as its theoretical underpinnings to analyze quantitative surveys of students and teaching staff in light of review studies on related topics (Arndt et al. 2020 & Pausits et al. 2021). The outcome of this study shows that full-time and part-time students have different needs and acceptance levels regarding distance learning and digital tools. Shifts in these needs and requests are observed after one year of being forced to work with digital tools,
with both students’ and teaching staff’s attitudes generally becoming more
accepting.

Data collection consisted of four surveys conducted at the FHW. Students
were first surveyed from April 8th to April 22nd, 2020, with a follow-up survey
conducted from March 2nd to March 20th, 2021. The latter student survey in
2021 achieved a response rate of 66.3%, attracting 561 participants comprising
69.1% female and 30.9% male respondents. Similarly, the initial survey of
lecturers ran from April 20th to April 22nd, 2020, and the follow-up from June
3rd to June 17th, 2021. The latter survey of lecturers in 2021 yielded a
completion rate of 70.35%, with the 159 respondents showing a gender
distribution of 56.6% male and 43.3% female.

The surveys were distributed amongst all students and lecturers of the
FHW, which offers ten different Bachelor programs and eight different Master
programs. Even though students from all study programs were invited, in 2021
most student respondents were enrolled in the following programs: BA in
Management & Entrepreneurship, the BA in Finance, Accounting & Taxation,
and the BA in Tourism & Hospitality Management. Meanwhile, respondents to
the 2021 lecturer survey consisted mainly of lecturers from the BA in
Management & Entrepreneurship, the BA in Corporate Communication, the
BA in Human Resources Management, the BA in Marketing & Sales, and the
BA in Journalism and Media Management participated. Lecturers at the FHW
University of Applied Sciences are qualified in different fields of Management
and Communication and work either as full-time employees or as external
lecturers. The 2021 lecturer survey consisted of 81.6% ‘external lecturers’ and
18.4% ‘full-time employees’ of the university.

Results

This section presents a selection of results from the FHW surveys that are
pertinent to the research question. These are structured according to the
relevant categories from Arndt et al. (2020)’s 13 areas of relevance related to
digitalization within universities: (a) workload, (b) life situation, (h) media-
technical and didactical competences, (j) technical infrastructure and tools, and
(k) virtual teaching and learning scenarios.

Workload

As shown in figure 1, below, students of the FHW der WKW University of
Applied Sciences for Management and Communication were asked whether
they think most teachers correctly estimate the workload for independent
assignments. A comparison between the years 2020 and 2021 shows that
student evaluations have become more positive over time. In 2020, a lower
percentage of students expressed ‘full agreement’ or ‘rather agreement’ that
lecturers correctly estimate student workloads, with a greater percentage
opining ‘less agreement’ or ‘no agreement at all’. Thus, an overall
improvement over time could be noted, even though almost one third of students still disagree (less agreement or no agreement at all) that lecturers estimate workloads correctly in 2021.

Figure 1. Student Evaluations of Teachers’ Correct Estimation of Workload/Comparison 2020 and 2021

Most teachers correctly estimate the workload for independent assignments (students' estimation).

![Bar Chart]

Source: Author.

Life Situation

Both students and lecturers were asked about their study mode preferences, where the synchronous study mode refers to simultaneous Distance Learning, while the asynchronous study mode involved delayed Distance Learning and without presence. This information seems relevant not only to how students prefer to organize their studies, but more broadly to organizing their study–work balance/study-life balance.

The data is presented in Figures 2 and 3, below, where Figure 2 shows a longitudinal comparison of study mode preferences by students between 2020 and 2021, and Figure 3 shows a cross-sectional comparison of study mode preferences between students and lecturers in the year 2021.

Figure 2. Comparison of Students’ Study Mode Preferences Between 2020 and 2021
Interestingly, Figure 2 shows that students have a stronger tendency towards the synchronous study mode in 2021 compared to 2020. After one year of distance education, students increasingly prefer to be simultaneously online when engaged in Distance Learning.

Figure 3. Comparison of Study Mode Preferences Between Students and Lecturers

<table>
<thead>
<tr>
<th></th>
<th>Students 2021</th>
<th>Lecturers 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synchronous</td>
<td>60.11</td>
<td>78.9</td>
</tr>
<tr>
<td>Asynchronous</td>
<td>39.89</td>
<td>21.1</td>
</tr>
</tbody>
</table>

Source: Author.

The increasing preference of students for synchronous instruction is also reflected among lecturers. Figure 3 shows that approximately 80% of lecturers prefer a synchronous study mode in 2021, exceeding the approximately 60% of students who prefer the synchronous study mode. It is clear that both target groups prefer synchronous study modes to asynchronous study modes, and that this tendency has increased over the course of the study period.

The FHW surveys further asked students about their level of satisfaction with Distance Learning, both in 2020 and again in 2021. The data presented
in Figure 4, below, show a comparison of student evaluations across these years.

*Figure 4. Student Satisfaction with Distance Learning in 2020 and 2021*

![Distance Learning student satisfaction chart]

*Source: Author.*

Interestingly, after one year of the COVID-19 pandemic, students expressed higher levels of contentment (“very satisfied” or “pretty satisfied”) with Distance Learning, while the percentage who are “partly satisfied, partly unsatisfied”, “pretty dissatisfied”, or “very dissatisfied” decreased in comparison to 2020. This shows that students are generally more satisfied with Distance Learning now than they were when commencing this experience.

**Media-Technical and Didactical Competences, Technical Infrastructure and Tools, and Virtual Teaching and Learning**

As shown in Figure 5, students were also asked about the appropriate deployment of technical infrastructure and tools used for Distance Teaching. For the purposes of Distance Teaching at the FHW, the four tools Moodle, Microsoft Office 365, Zoom, and Panopto were employed. In Figure 5, student evaluations are compared between 2020 and 2021.
As shown in Figure 6, students found Moodle to be even more appropriate for their studies in 2021 than in 2020. The graph also reveals that the proportion of students in the ‘not used yet’ category declined over the course of the year.

Figure 7 shows that more students consider the online tool Microsoft Office 365 as ‘appropriate’ to ‘very appropriate’ in 2021 than in 2020. As with Moodle, the percentage of students who claimed not to have used the tool also declined from 2020 to 2021.
Contentment with the online tool Zoom also increased between 2020 and 2021, as shown in Figure 8. In 2021, students are more likely to find Zoom ‘very appropriate’ to ‘appropriate’, as the proportion of students declaring that they had ‘not used (Zoom) yet’ dropped to near zero in 2021.

As Figure 9 demonstrates, even though students find the online video platform Panopto slightly more appropriate in 2021 than 2020, most participants had still not used the video platform.
Figure 9. Panopto for Distance Learning (2020 and 2021)

Panopto Videoplattform

![Panopto Video Comparison](chart.png)

Source: Author.

Discussion and Conclusions

The results of the FHW student and lecturer surveys offer valuable insights regarding questions about the acceptance of digital education by students and educators. Since the surveys were conducted at the beginning and at the end of the first year of COVID-19 restrictions in Austria, they enable identification of shifts in attitudes towards digital education.

Compared to the related studies cited in the literature review section of this paper, the FHW results correlate well with their results. Hence, while student satisfaction correlates with their perceived usefulness towards digital education in the Ilgaz/Askar (2013) study and therefore has the tendency to increase as more students get used to digital education, the FHW results show that one year into the pandemic 59.3% of students are “very satisfied” or “pretty satisfied” with distance learning, compared with only 34.4% the year before. On the other side of the equation, the percentage of ‘pretty unsatisfied’ to ‘very dissatisfied’ students declined from 2020 (26.4%) to 2021 (7.6%), which also indicates the positive overall trend.

Related to the workload, which according to Arndt et al.’s (2020) BRIDGING study became higher compared to face-to-face-semesters, the following results were observed in the FHW surveys. Student (full or rather) agreement with the proposition that lecturers correctly estimate workloads rose from 22.7% in 2020 to 37.1% in 2021, while disagreement (less or no agreement) with this statement fell from 47.4% in 2020 to 32.6% in 2021. Although the FHW surveys do not facilitate a direct comparison of students’ workload perceptions between traditional teaching model and distance learning models, the improvement in student evaluations of the accuracy of lecturers’ workload estimations from 2020 to 2021 nevertheless indicates issues of
increased workloads when switching to distance learning. Although this issue seems to have somewhat mitigated over time, the approximately one third of students who continue to express issues with workloads in 2021 suggests value in further research on this point.

Another area of relevance for digitalization within universities identified by Arndt et al. (2020) was that of life situation. Related to this element, the FHW survey results show that students and lecturers have certain preferences when it comes to study modes. Even though it could be assumed that students and lecturers actually prefer an asynchronous study mode, meaning that teaching and learning happen independently of time and place, results from one year after the outbreak of the pandemic surprise with a different outcome. While 54% of students preferred a synchronous teaching mode in 2020, a slight increase to 60.11% was noted in 2021. Interestingly, the comparison of students’ and lecturers’ study mode preferences in 2021 shows that lecturers prefer synchronous study modes even more strongly, with 78.9% favoring this option and only 21.1% preferring asynchronous teaching. This development shows that after one year of the pandemic, both parties prefer synchronous study modes involving more interactive and engaging teaching. This effect also supports the findings from the FHW surveys regarding lecturer’s preferences for Zoom, which is a helpful tool for synchronous classes. Therefore, in contrast to the BRIDGING studies, the preference for Zoom can not only be attributed to its good performance, but also because this tool satisfies lecturers’ and students’ needs.

The FHW surveys provide hints that with the passage of time in which universities are forced to adapt to distance learning, their technical competence increases. Hence, “perceived ease of use” - a determinant of acceptance according to TAM - enhances as well. Overall, there is a clear positive development in levels of satisfaction with distance learning at the FHW.

References


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