A Comparative Analysis of User Experience of the Microsoft Teams, Google Meet and Moodle E-Learning Platforms

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Abstract Lately, user experience (UX) has become an important and frequently used approach to determine the perception of digital products and services. UX measures what users feel and sense directly while getting to know and using these products and services regularly. In this study, which was conducted in Slovenia and in Bulgaria, we have researched the UX of students related to the Microsoft Teams (MS Teams), Google Meet and Moodle e-learning platforms. We used a standard and freely available User Experience Questionnaire (UEQ) that was developed to measure the UX of interactive products and services. The preliminary research showed that the MS Teams obtained the highest score among all the measured UX scales. Google Meet had slightly lower values, while Moodle had the lowest average values. The data also show that in terms of pragmatic quality, MS Teams was rated the best followed by Moodle and Google Meet. The students find Google Meet the weakest in terms of the quality of its task-related aspects. The hedonic quality data shows MS Teams first, followed by Google Meet and Moodle. The results of the research have been analysed and discussed, and future research suggestions have been defined.

Keywords: UX (user experience), Google Meet, Moodle, Microsoft Teams, students

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1 Introduction

Collaboration platforms have become very important in recent years, more so due to the worldwide pandemic, which fundamentally influenced all aspects of our lives. Vendors and solution providers are regularly launching new IT solutions and applications on the market, and organisations are looking for innovation and sources of competitive advantage, as well as more efficient ways of performing business processes and communicating. One branch of these platforms is e-learning solutions, whether stand-alone applications such as Moodle, or collaborative applications with e-learning support such as Microsoft Teams (MS Teams) or Google Meet. Typical e-learning platforms must offer support for study material sharing and videoconferencing for lectures. Moreover, modern collaboration functionalities also include announcements, links, online quizzes, online contact hours via chat, assigning and collecting assignments. With new versions, upgrades and more frequent use, users have started to use collaboration platforms at different, usually more advanced, levels. This affects users' attitudes toward collaboration platforms and how they, as users of these platforms, perceive new technology. Acceptance of platforms and applications can be researched using user experience (UX) concepts. UX covers all aspects of digital products and services that users feel and sense directly while getting to know and regularly using these products and services (Hassenzahl, 2010).

In this research paper, an explanation is given of e-learning collaboration platforms. An overview of the characteristics and functionality features of MS Teams, Google Meet and Moodle is provided. Based on a standard and freely available UEQ questionnaire, we have analysed the user experience of MS Teams, Google Meet and Moodle. UEQ questionnaires are used to measure the user experience of interactive products and services (Laugwitz et al., 2008). The scales of the questionnaire cover a comprehensive impression of user experience. Both classical usability aspects (efficiency, perspicuity, dependability) and user experience aspects (originality, stimulation) are measured. This paper provides a comparative analysis of MS Teams, Google Meet and Moodle user experience by students of economics and business from Slovenia and Bulgaria. The aim of the research is to identify the factors that influence students' user experience when using the aforementioned e-learning collaboration platforms during their study during the COVID-19 pandemic. The

survey was conducted among students from Slovenia and Bulgaria. We have described and analysed the findings, discussed the results and defined future research options.

2 E-learning collaboration platforms

The range of collaboration tools and solutions has increased since the start of the pandemic. When referring to collaboration, this is meant in the broadest meaning of the word, i.e. considering internal collaboration among employees and external collaboration with partners across the whole value chain (Barratt, 2004). Collaboration platforms for e-learning are one of the important use areas that are being used for distant learning support on different education levels. These platforms are crucial for uninterrupted pedagogical work as they facilitate e-learning in various forms. The reality is that different applications need to be used to cover all aspects of work, as no universal application or software can cover all business scenarios. For the education sector, this means that universities and schools are still using other applications to fully support the study process, for example, proprietary exam systems, e-mail systems, web portals, etc. Developers of collaboration tools and solutions are using past experiences to provide elevated functionalities for different use scenarios, some of which are more universal, for example MS Teams and Google Meet, while others less so, e.g. Moodle. Regardless of the vendor, collaboration tools must be in line with business needs (Eisenhauer, 2021).

Some authors (Eisenhauer, 2021) have pointed out that the pandemic led to collaboration tools becoming the main facilitator for any kind of communication – from business, education, public sector, healthcare, to even personal use as an additional way of staying connected with family and friends in times of limited movement or quarantine. As the frequency of use increases, users are starting to use collaboration platforms on different, usually more advanced, levels. This affects users' attitudes toward collaboration platforms and how they, as users of these platforms, perceive new technology.

In its latest magic quadrant for the MS Teams application, Gartner (Microsoft, 2021) recognised Microsoft as a leader for both meetings solutions and unified communications as a service. Microsoft was positioned highest among all vendors for its ability to execute both reports. MS Teams is a hub for teamwork where people – whether internal and external – can connect and collaborate synchronously. People can hold meetings or make calls one-on-one with fully integrated voice and video, informal chats, co-authoring a document, or work together in other apps and services. MS Teams offers a shared workspace for people to iterate quickly on a project, work together with team files and collaborate on shared deliverables. Every new team creates a new Microsoft 365 group, a Sharepoint online site, a document library, an Exchange online with a shared mailbox and calendar, and a Onenote notebook, and ties into other Microsoft 365 and Office 365 apps such as Planner and Power BI (Microsoft, 2021). Microsoft has added almost 100 capabilities to its Teams app to streamline work and automate processes to help users before, during, and after a meeting. In education, MS Teams has been the platform of choice in many cases, as full spread online courses were being offered due to the pandemic restrictions. MS Teams also has several education-specific functionalities and is adding new ones almost every month, such as assignment support and grading, insights for interaction analytics, forms integrations for polling, etc.

Google Meet is an easy-to-use video conferencing application, suitable for business and education. Google Meet is available free with limited functionalities, and also offers a wide variety of features in paid service plans, tailored for business and education. The free education edition supports (Google, 2022):

- Joining calls from anywhere, on different devices (no plugins or downloads needed)
- High-quality video and audio across multiple operating systems and devices
- Integration with Classroom and other Google Workspace for Education products
- Multiple co-hosts

The paid editions also offer the option to save recorded meetings to Google Drive, sharing, tracking attendance with analytical reporting, and many more functions. Google Meet is a pure video conferencing solution. Meeting organisers can set up using Google Calendar, meeting link URLs or codes, dial-in by phone numbers, and through proprietary Google Meet hardware such as Chromebox and Chromebase for meetings devices. Due to its wide adoption in business as well as education, it features robust security and encryption (Sevilla, 2020).

The Moodle (Modular Object-Oriented Dynamic Learning Environment) learning management system is a secure web-based environment used for the development and delivery of course activities and resources. Moodle allows teachers to organise and store course content in a secure web-based environment, which their students can access from anywhere at any time. Teachers can post, collect and grade assignments, administer quizzes, host online discussions, share resources, and more. It is present in various sectors ranging from K-12 schools, higher education and vocational training to workplace environments. With over 300 million users in over 240 countries, it is the leading learning management system worldwide (Moodle, 2022a). Moodle offers a modern interface and offers communication and collaboration features (including real-time chat, discussion and sharing of files) for students and teachers. In a comparative analysis of several open-source learning management systems, the authors found that Moodle has the best communication tools with user-friendly interfaces (Cavus and Zabadi, 2014). As Moodle is open source, it is constantly expanding its features and functionalities. The community is also developing numerous plugin features that help keep the environment up to date. Moodle plugins are components that can be installed on a user's Moodle platform to add a specific feature, functionality or even appearance to their Moodle site. More than 1,500 open-source plugins have been developed to date and are available in the Moodle Plugins directory for download (Moodle, 2022b).

3 User Experience (UX)

The evaluation of software applications can be done using quantitative aspects, however, it is often down to the user's subjective opinion. One characteristic often used is User eXperience (UX), which relates to the end users' actual experience with the software. ISO/IEC 9241 (ISO, 2010) defines UX as "a consequence of the

presentation, functionality, system performance, interactive behaviour and assistive capabilities of an interactive system, both hardware, and software. It is also a consequence of the user's prior experience, attitudes, skills, habits and personality." It is restricted to products and whole systems and services with everything that belongs to the user journey creating a user experience before using a product or system (Van de Sand et al., 2020). A good UX contributes to higher work motivation and performance and can also affect the well-being of users and is crucial to maintain or gain market shares (Hassenzahl, 2010; Nass et al., 2012). The service around a product and the whole system of a product impacts users' perceptions as well (Van de Sand et al., 2020).

When designing products to ensure a positive user experience, the designers' goal is that the character of the intended product creates appeal, pleasure and satisfaction. From an user perspective, qualities are perceived, evaluated and experienced in the context of use, which ideally leads to appeal, pleasure and satisfaction. However, this can be only achieved by a certain level of pragmatic and hedonic qualities. The content and functionality of a product need to be reasonable and useful. Interactions need to be easy to understand and smooth. The presentation has to be appealing, pleasurable and in coherence with the brand personality system (Van de Sand et al., 2020).

There are a variety of methods specifically developed to measure and study UX-related constructs. For this research study, we have used a standard and freely available UEQ questionnaire used to measure the UX of interactive products and services (Laugwitz et al., 2008) which is described in the following section.

4 Methodology and research

To examine the usability of a system, it is necessary to study how efficient, effective and satisfactory a product is. In addition to this, it is important to address a specified context of use by a specified user with a specified goal. The authors of the UEQ developed a questionnaire that allows a quick assessment covering a comprehensive impression of user experience. It was designed to allow users to express the feelings, impressions and attitudes that arise when experiencing the product in question in a very simple and immediate way (Laugwitz et al., 2008). The UEQ contains six scales

with 26 items. The scales are attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty. While attractiveness is a pure valence dimension; perspicuity, efficiency and dependability are pragmatic quality aspects (goal-directed), and stimulation and novelty are hedonic quality aspects (not goal-directed).

We have conducted a comparative analysis of MS Teams, Google Meet and Moodle user experience among students of economics and business from Slovenia and Bulgaria. The data were collected in autumn 2021 at the Faculty of Economics and Business Maribor (FEB), Slovenia, and at the University of Economics (UoE), Varna, Bulgaria. Both universities use multiple applications to support the study process. In Slovenia, MS Teams and Moodle are used, while in Bulgaria, Google Meet and Moodle are used. This fact influenced the number of responses collected, as the cumulative sample consists of 247 responses for MS Teams, 335 responses for Moodle, and 129 responses for Google Meet. All the responses were collected using electronic questionnaires. The results were transferred to Microsoft Excel for further analysis using predefined UEQ tools.

All students at the FEB use Moodle as a primary e-learning solution (mainly study material sharing) and MS Teams as a go-to application for videoconferencing for courses and exercises. Similarly for UoE in Varna, a combination of Moodle and Google Meet was used for study process support.

Table 1 and Figure 1 illustrate that the means of the values of the scales for MS Teams have the highest values of all the scales measured. Slightly lower mean values were observed for Google Meet, while Moodle had the lowest average values. When analysing individual scales, it can be seen that MS Teams leads on all the scales, while there are some differences with Google Meet and Moodle – Google Meet has higher values in terms of attractiveness, perspicuity, stimulation and novelty, while Moodle has higher values in terms of efficiency and dependability.

Table 1: UEQ Means of the Scales

UEQ Means of the Scales			
	MS Teams	Moodle	Google Meet
	N=247	N=335	N=129
Attractiveness	1,754	1,047	1,267
Perspicuity	1,725	1,378	1,419
Efficiency	1,595	1,339	1,295
Dependability	1,662	1,339	0,965
Stimulation	0,892	0,546	0,814
Novelty	1,111	0,369	0,533

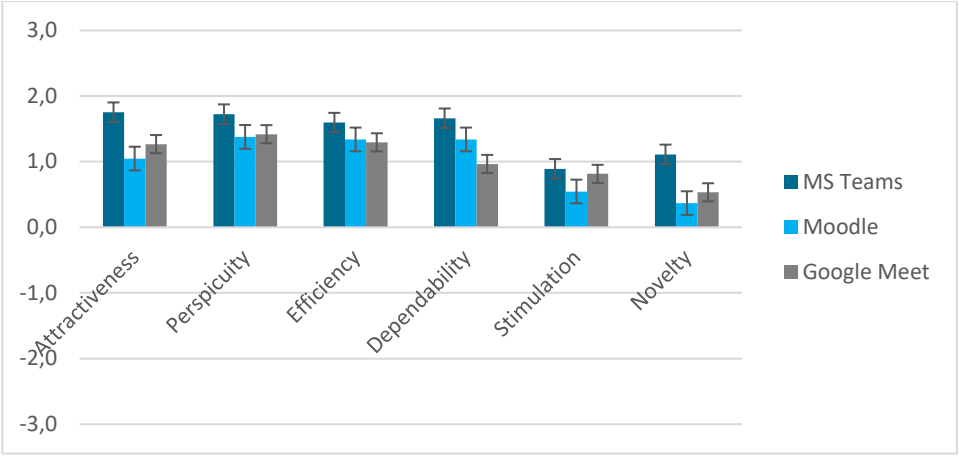

Figure 2: UEQ Means of the Scales
Source: own.

As can be seen from the comparison of all three compared applications above, the lowest values were observed for stimulation and novelty scales. It could be argued that this is due to the circumstances of the application use, as for a majority of the time the students were forced to switch to e-learning, which can affect their motivation and stimulation. In terms of novelty, it can be seen that the difference in means of the scale is substantial and in favour of MS Teams as opposed to Moodle or even Google Meet. It seems that the students find MS Teams the most modern application, which is also explained by the fact that Microsoft is constantly

innovating and introducing new features to the platform, which tends to affect user perception.

The scales of the UEQ can be grouped into pragmatic quality (perspicuity, efficiency, dependability) and hedonic quality (stimulation, originality). Pragmatic quality describes task-related quality aspects, while hedonic quality the non-task related quality aspects. A similar picture can be seen when analysing the values in Table 2. The MS Teams application has the highest mean values of the three compared applications. In terms of the pragmatic quality, it can be seen that MS Teams is rated the highest followed by Moodle and then Google Meet. Therefore, the students find Google Meet the weakest for task-related quality aspects. In terms ofh hedonic quality, the order of the applications is MS Teams followed by Google Meet and Moodle. Therefore, the results show that the students find Moodle the weakest in terms of stimulation and originality scales.

Table 2: Pragmatic and Hedonic Quality

Pragmatic and Hedonic Quality			
	MS Teams	**Moodle**	**Google Meet**
	N=247	N=335	N=129
Attractiveness	1,75	1,05	1,27
Pragmatic Quality	1,66	1,35	1,23
Hedonic Quality	1,00	0,46	0,67

5 Discussion and conclusion

The pandemic has brought challenges in all areas of our lives. One of the areas that has been most impacted is the way we teach, work and do business. We interact with each other all the time, and technology has facilitated new ways of collaboration that were not possible in the past. The Cloud infrastructure from leading Cloud providers such as Microsoft and Google has supported and enabled different forms of e-collaboration.

The challenges of the pandemic have also been substantial in the field of education, as the majority of organised education had to switch to distant learning. Traditional e-learning platforms such as Moodle have been in place for years, but were used for basic tasks such as file sharing and were not suitable for full-scale video conferencing. Alternatives such as MS Teams and Google Meet were already in place and seemed like a logical choice. As the study process was conducted online only, more functionality started to be utilised.

We have begun research into the UX of collaboration platforms, as it influences the way users perceive applications and products. UX research is quite popular, and there are a lot of methods in use. In this research, a UEQ questionnaire was chosen, which measures the impression of user experience. Analysis has shown that the UX experience for MS Teams was assessed the highest for all the UX aspects measured. Slightly lower values were observed for Google Meet, while Moodle had the lowest average values. The data also show that when looking at pragmatic quality, MS Teams was rated the highest followed by Moodle and Google Meet following. The students find Google Meet the weakest for task-related quality aspects. Hedonic quality data shows a slightly different order of the applications, namely MS Teams followed by Google Meet, and Moodle. These results must also be interpreted in the context of the functionalities of each application. There are differences in the applications compared, the most obvious being the fact that Google Meet does not offer such a wide feature set as both the other tools, since its main purpose is videoconferencing support. It lacks other features that both Moodle and MS Teams have, such as messaging, file sharing, etc.

It is for this reason that we see a lot of potential for future research. It must be emphasised that this is preliminary research with some limitations. As described in previous sections, we combined the samples of students from both universities using the Moodle application, so the differences in the perceived UX could be analysed between the students of the two universities. For future research, more data should also be gathered with bigger sample sizes, and a more in-depth analysis could be carried out, including reliability analysis and factor analysis. Additionally, since the UX changes with time, the data gathering process and analysis could be repeated and the results compared. Another area of future research could be to research the UX of e-learning platforms from teachers' viewpoints.

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