Examination of students' acceptance and intention to use a New LMS during COVID-19 pandemic

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CHRONICLE	ABSTRACT
	The aim of this research is to study the acceptance of university students to use Microsoft Teams e-Learning system and their intention to use it as a Learning Management System (LMS) for education during the COVID-19 pandemic in Jordan. An ex-tended Technology Acceptance Model (TAM) with a blend of external factors that are used together for the first time was developed and used for the purpose of this study. TAM was used because of its wide use and success during the past few years for evaluating the influence of different factors affecting the acceptance and intention to use e-Learning platforms within educational institutes. However, all the studies were examining the variables and factors affecting the behavioral intention and acceptance to use LMSs when normal and conventional classroom study is available. In this research, seven external variables, in addition to the four TAM variables, were introduced in a model including one external variable, Internet Connectivity (IC), used for the first time in the field of education. A model is constructed by extending TAM with the introduced external variables, hypotheses are constructed and a questionnaire for 396 students at two universities in Jordan is conducted. Reliability, confirmatory factor, model fit, and hypothesized structural model analyses are presented. Results show that all the variables tested affect, either directly or indirectly, the acceptance and intention to use MS Teams during the pandemic. 21 hypotheses were tested between the constructs and found significant except the relations between (Social Norm - Perceived Usefulness) and (Technical Support - Perceived Usefulness).

1. Introduction

E-learning can be defined as a tool through which students can access educational courses material at different formats such as audio, video and text, as introduced in (Abdullah et al., 2016) and (Arkorful & Abaidoo, 2015). Tools extend to provide functionalities as send and receive emails, contact and discuss using online forums and submit quizzes and assignments. In contrast to conventional face-to-face classrooms learning, such online tools allow students to reach educational information uploaded by their lecturers and perform the required tasks whenever they need using Internet (Abdullah, Ward, & Ahmed, Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios, (Abu-Shanab, Ababneh, & Momani, 2012; Arkorful & Abaidoo, 2015). According to Arkorful and Abaidoo (2015), this is considered as a cost-effective way of learning. The E-learning process can be easily managed through LMSs such as Moodle and Blackboard. Materials delivery, assignments, quizzes, monitoring students' performance, marking, showing results in exams and communications can be done through different systems such as introduced at (Alias & Zainuddin, 2005; Mahnegar, 2012; Park, 2009; Piña, 2013). Learning Management Systems gained

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high importance during the past few years as an e-learning part of the educational process in educational institutes all over the world as illustrated by Liaw (2008), Liaw and Huang (2013), Abu-Shanab et al. (2012) and Sánchez and Hueros (2010). In Jordan, almost all Universities are using such systems for different purposes such as publishing courses' syllabi, sharing materials, making quizzes, submitting assignments and communication between lecturer and students.

Lately, during COVID-19 pandemic, Jordanian government locked down the educational sector all over the country. All Universities transferred to online learning by law. Although students were already using LMSs and they are used to them as an online part of each course, they have never practiced full online distance learning before. During the pandemic, different Universities adopted different LMSs that suited the situation of pandemic, such as Microsoft Teams system and Google Classroom for online lectures. COVID-19 pandemic has influenced the educational sector as a result of social transformation (Corell-Almuzara et al., 2021) and Lopez-Belmonte et al. (2021). Microsoft Teams system, in specific, was used at schools and some universities in Jordan with a combination of other Microsoft products such as Forms and Stream to manage the online educational process. This process includes giving lectures, assignments, quizzes, exams, uploading materials and other required educational functionalities. Some studies believe that inspecting perceived usability of the online learning platforms in the situations of physical classroom absence is a very important aspect (Pal & Vanijja, 2020; Laurencia & Sudarto, 2021). This actually supports and motivates this research. Study by Pal and Vanijja (2020) states that before the pandemic, online learning and its supportive platforms were considered as supplementary for the physical classroom learning instead of being, suddenly, the main and solely learning way.

Students' adoption of an LMS depends mainly on organizational factors such as the adoption of and dependency on an LMS to deliver the course material by the faculty member, the teaching style and the rules enforced by the educational organization as cited at (Naveh et al., 2010) and (Ngai et al., 2007). Additionally, integrating the LMS with lectures and course teaching style will encourage the students to involve and take an active role in using it (Carvalho et al., 2011) and (Ngai et al., 2007). Based on that and in relation to the current research, it can be said that adopting an LMS such as MS Teams system into lectures and making it the only available way of teaching during CoronaVirus pandemic should have an extreme effect on encouraging the students to use the system, acceptance of the system by the students and behavioral intention to use it by them. On the other hand, LMSs can be adopted differently at different institutions based on several environmental factors (Rogers, 2003). Yalcin and Kutlu (2019) documented that "the students' perspective and engagement are very important to evaluate the adoption and success of the LMSs". Based on that, this research, such as other research available in the literature reviewed, focuses on the acceptance of students to a new LMS, MS Teams system in specific, as the main and only teaching method during COVID-19 pandemic. The acceptance of a new LMS has been studied before at several studies with different variables affecting it. However, the problem of this research arises from the fact that MS Teams system is a newly adopted LMS by many educational institutions in Jordan at a special educational situation that COVID-19 pandemic forced. According to the author's knowledge, the MS Teams system has not been used at any institution before as an LMS in Jordan. Instead, they were using different LMSs such as Moodle, Blackboard or other own-built systems. According to (Black, Beck, Dawson, Jinks, & DiPietro, 2007) and (Carvalho, Areal, & Silva, 2011), moving to a new system will impact negatively on the experience of students. It needs time to allow reuse of the system through different courses and, it is believed, over several semesters to encourage positive learning experience and acceptance of the system. This may be an exception with what (Wang et al., 2012) introduced as they concluded that LMSs integration with courses curricula at universities will enhance students' acceptance and usage of it without time and experience limitations. For the purpose of studying the acceptance of students to MS Teams as a new LMS during the pandemic in Jordan, Technology Acceptance Model (TAM) is used.

Technology Acceptance Model (TAM) and its extensions was used, by several studies, as a tool to discover the behavioral intention to adopt and accept an LMS. According to Park (2009), Tarhini (2014) and Tarhini et al. (2015), technology acceptance by students will increase their academic improvement and learning experience. The factors that control the acceptance, intention to use and adoption of an LMS by students are important to be discovered. They are considered as the tuner to specify the attraction of students for continual use of the system in their education as introduced by Park (2009). Literature review of Yalcin and Kutlu (2019) concludes that social norm, computer self-efficacy and user interface design are affecting adoption of an LMS the most. They included these three external variables with another in one model and called it extended TAM (e-TAM) for the purpose of explaining the actual use and adoption of an LMS.Similar studies on MS Teams have been conducted by Pal and Vanijja (2020) and Laurencia and Sudarto (2021). However, Pal and Vanijja (2020) studied the difference in perceived usability between different consumption platforms (smartphones and laptops) in addition to the relationship between measures used for perceived useability at two different domains (Human Computer Interaction and Information System). Moreover, both studies Pal and Vanijja (2020) and Laurencia and Sudarto (2021), which were done in India and Indonesia, used the original TAM instead of studying extra external factors used in this study, which is conducted in Jordan.

The rest of the paper presents the problem and the aim of the study in detail, the methodology of constructing the model and its hypotheses based on the literature reviewed and the methodology followed in sampling and collecting data. The paper then shows the analysis conducted and results gained from the collected data. Finally, the paper concludes and discusses the results with a presentation of the limitations and future work to be done.

2. Problem statement and study aim

TAM has been used by several researchers because of its explanatory power. However, it has been criticized because it lacks several external variables that may cause an effect on the behavioral intention to use and acceptance of the technology as mentioned at (Teo, 2009; Teo et al., 2019). One of the most recent papers that extended TAM with several external variables was Teo et al. (2019) who studied 6 external variables. Their study focuses on the factors affecting the behavioral intention to use the technology. In general, there is a shortage in studies conducted outside the "Western contexts", the factor that may produce biased results affected by the cultural dimension (McCoy et al., 2005). It is believed that this is true to some extent, which needs more comparative research to discover the gap between developed and developing countries. For example, Moodle in education may not be used extensively in developing countries, in Jordan as example, as they are used in developed countries such as the USA or Europe (Hölbl & Welzer, 2010). Moreover, it is believed that very little research has evaluated the behavioral intention to use and the acceptance of technology during the COVID-19 pandemic. During the literature review of this study, little research was found to evaluate this period such as (Khan, 2020; Verawardina, et al., 2020; Yusu & Ahmad, 2020). The importance of studying this period of students' life and their acceptance to the technology is that technology was used extensively for educational purposes. Accordingly, the first aim of this study is to examine and discover the acceptance of students to new technology that they were forced to use by law in Jordan. The aim extends to include studying the effect of moving to full distance learning without any conventional classroom teaching on the acceptance of LMSs, specifically MS Teams system. One more aim is to study a blend of external variables that were collected from different research and they are used together for the first time within TAM. These external variables were selected because they have not been used together before and it is believed that they are affecting the acceptance of the new technology within the pandemic circumstances. A new one more external variable, Internet connection, which represents the quality of Internet connection was included in this study which has not been included at any study for studying acceptance of LMS before in the literature reviewed. It has been included as an external variable at different domains, such as at (Al-Somali et al., 2008; Shin, 2009), but not in the education field. Introduction of this variable was motivated as an affective factor for two more reasons. The first is that researchers, as University faculty members, noticed that several students were complaining against Internet connection. They blame it for bad quality connection during online lectures, submitting assignments and communication issues. They also claim that their absence sometimes is a result of this problem. These paper authors themselves practiced such problems during online lectures and uploading materials. The second reason is that the Internet Service Providers (ISPs) in Jordan admitted that their framework and infrastructure do not support quick shifts to depend solely on the Internet in several sectors. Banking, businesses and distance learning in all the educational institutes including schools were using the Internet as the only way of continuing life and work. All the sectors were using the Internet at the same working hours which caused a heavy traffic on the communication infrastructure not supporting such traffic. In the education sector, especially universities, several lecturers rescheduled their online lectures to be out of the working hours. This is to enable them and their students to communicate and conduct their lectures smoothly. To Make it worse, the people who are sitting at home, during the lockdown, were using the Internet far away more than normal, either to run their work or fill their free time and to follow up the pandemic related news. It is important to mention here that the internet connectivity variable may not be a variable tested at some other LMS because MS Teams functionalities provide the ability to use it as an online classroom. This functionality extends the usefulness of MS Teams to be used solely for running the whole educational process starting from giving the lecture and ending with other functionalities such as submitting the exams and assignments. Finally, an aim of this study is to test the model constructed on the students' behavioral intention to use the new technology in Jordan, as a generalization for the results.

3. Research model and hypotheses

3.1 Technology Acceptance Model (TAM)

TAM is one of the models that is used to measure the acceptance of human to technology in different domains including social networks, e-business, games, e-learning and other domains, such as illustrated at (Bajaj & Nidumolu, 1998; Karahanna et al., 2006; Tarhini et al., 2014; Tarhini et al., 2015; Teo & Ursavaş, 2012; Ursavas, 2013). It is introduced for the first time in (Davis, 1989) (Fig. 1).
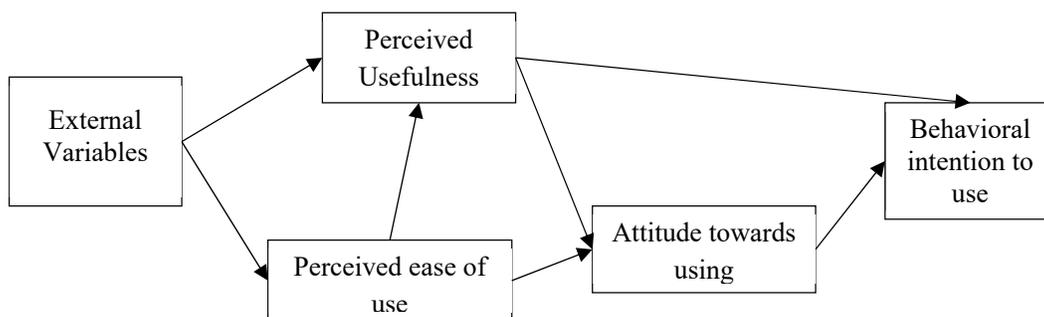

Fig. 1. Original technology acceptance model (TAM) (adopted from Davis, 1993).

TAM was studied in combination with different external factors. The most used external variables, according to Yalcin and Kutlu (2019), are social norm, computer self-efficacy and user interface design.

Table 1 shows the external variables used in this research with some literature reviewed and cited these variables in the LMSs domain as the technology under study.

Table 1

External variables with the references

Variable	Reference
User Interface Design	(Yalcin & Kutlu, 2019), (Mouakket & Bettayeb, 2015)
Social norm or Subjective norm	(Yalcin & Kutlu, 2019), (Teo, Zhou, Fan, & Huang, 2019), (Ahmad & Ward, 2016)
Computer self-efficacy	(Yalcin & Kutlu, 2019), (Sánchez & Hueros, 2010), (Mouakket & Bettayeb, 2015)
Attitude	(Teo, Zhou, Fan, & Huang, 2019), (Sánchez & Hueros, 2010)
Training	(Escobar-Rodriguez & Monge-Lozano, 2012)
Perceived community building	(Islam, 2013)
Technical Support	(Sánchez & Hueros, 2010)
Connectivity to Internet	(Al-Somali, Gholami, & Clegg, 2008)

3.2 Research model and hypotheses

This study employed a total of eleven variables (seven external) to explain the behavioral intention to use Microsoft Teams System by university students. The expected relationships between these variables can be seen in Fig. 2.
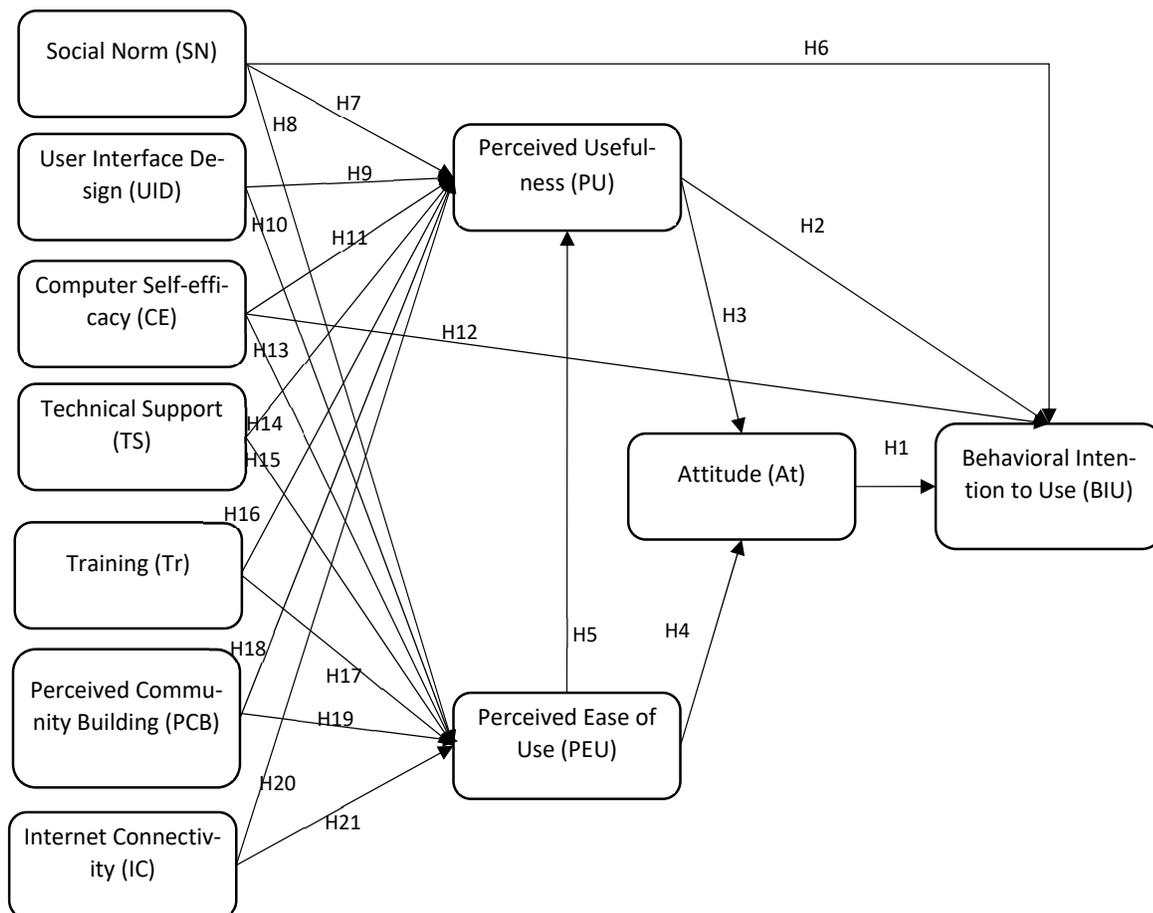

Fig. 2. Expected relationships between variables (proposed model)

The introduced model adopted the main variables of TAM. Teo et al. (2019) introduced that TAM has four main variables, perceived usefulness (PU), attitude to use the technology (At), perceived ease of use (PEU) and behavioral intention to use the technology (BIU). The purpose of TAM is to discover and specify the relationships between these variables (Teo & Ursavaş, An Assessment of Pre-Service Teachers' Technology Acceptance in Turkey: A Structural Equation Modeling Approach, 2012) and to explain the behavioral intention to use the technology (Venkatesh & Bala, 2008). The introduced model employed 7 external variables, social norm (SN), user interface design (UID), computer self-efficacy (CE), technical support (TS), training (Tr), perceived community building (PCB), and Internet connectivity (IC).

Behavioral intention to Use (BIU) can be defined as "a measure of the likelihood that a person will employ the application" (Lederer et al., 2000) which TAM was originally introduced to explain and predict (Venkatesh & Bala, 2008). The attitude to use an LMS (At) can be considered as the degree to which the student will favor to use the LMS (Davis, 1989) which leads to affecting the behavioral intention to use it. Based on that, H1 can be defined as:

H1: *(At) will positively affect (BIU).*

Perceived Usefulness (PU) can be defined as "the degree to which an individual believes that using a particular system would enhance his or her performance" (Davis, 1989). PU will have a direct effect on the behavioral intention to use (Davis, 1993) and the attitude to use the LMS as illustrated by Karahanna et al. (2006) and Liu et al. (2010). Accordingly, H_2 and H_3 can be formulated as:

H2: *(PU) will positively affect (BIU).*
H3: *(PU) will positively affect (At).*

Perceived Ease of Use (PEU) can be defined as the perception of the student for the mental effort and time consumption required to use the MLS (Davis, 1989). It is logical to think that when the new LMS is easy to use, the student will feel the higher usefulness of it. Similarly, when the student finds the new LMS does not require mental effort and does not consume their time, they will be motivated to use it. This argument leads to study the following hypotheses:

H4: *(PEU) will positively affect (At).*
H5: *(PEU) will positively affect (PU).*

Social Norm (SN) is an effective external factor that affects the PU. It can be defined in this context as encouraging of using the LMS by the student based on the advice and, maybe use, of the system by their influencers or people who are important to them. Abdullah and Ward (2016) cite that SN is considered, based on a survey, as one of the most commonly used and influential factors affecting the perception of usefulness to the technology. Because of its high importance, it is decided, in this research, to test the direct effect of SN on the BIU. This relation was also studied by Yalcin and Kutlu (2019). Additionally, during the special circumstances of COVID-19 as everybody, including the influencers, are forced to use Microsoft Teams as an LMS, it is decided to study the relation between social norm and perceived ease of use. Therefore, in this study, the following hypotheses are constructed:

H6: *(SN) will positively affect (BIU).*
H7: *(SN) will positively affect (PU).*
H8: *(SN) will positively affect (PEU).*

User Interface Design (UID) can be considered as the follow of proper directives to produce spontaneous user interface components design such as designing menus and icons. Based on (Mouakket & Bettayeb, 2015), user interface design affects the ease of use for the technology. Liu et al. (2010) implicitly included the friendly user interface design within the perception of ease of use. Moreover, Mouakket and Bettayeb (2015) introduced that user-friendly interface has an effect on student feeling regarding the technology usefulness. Accordingly, this research proposed the following two hypotheses:

H9: *(UID) will positively affect (PU).*
H10: *(UID) will positively affect (PEU).*

Computer Self-Efficacy (CE) can be defined in this context as the belief of students being able to use the LMS and overcome the challenges. This belief affects the acceptance of the new technology (Venkatesh & Davis, 1996). Since all the students participating in this research are already using an LMS other than MS Teams, this may directly affect their intention to use the new system. Moreover, it is believed that CE affects directly the ease of use and feeling of the usefulness of the LMS therefore, the following hypotheses are proposed:

H11: *(CE) will positively affect (PU).*
H12: *(CE) will positively affect (BIU).*
H13: *(CE) will positively affect (PEU).*

Technical Support (TS) can be defined as the availability of learning materials and help to use the new LMS. Teo and Ursavaş (2012) introduced TS under the "Facilitating Conditions" factor which affects the ease of performing a task. It is important to mention here that at both sampled universities used in this research, technical support was provided throughout answering the students' inquiries about using MS Teams by universities computer centers and course lecturers. A study Ngai et al. (2007) found that TS is one of the most affecting factors on PU and PEU. A study by Sánchez and Hueros (2010) also introduced TS in their model with a direct effect on PU and PEU. Therefore, H12 and H13 are constructed as:

H₁₄: *(TS) will positively affect (PU).*
H₁₅: *(TS) will positively affect (PEU).*

Training (Tr) construct represents the training given to students on MS Teams as a new adopted LMS replacing other LMSs used previously. Training in this study was conducted through different videos prepared by faculty and computer center staff members. Islam (2013) introduced that, students and educators should be given a proper training to be able to use the system effectively. Robinson et al. (2005) and Escobar-Rodriguez and Monge-Lozano (2012) document that training has influence on the intention to use the introduced technology. Training can remove barriers to use the new technology (Keil et al., 1995). Some studies such as Teo and Ursavaş (2012) introduced training under facilitating conditions factor while others, such as Ngai et al. (2007) and Sánchez and Hueros (2010), introduced it implicitly within technical support. Similarly, Robinson et al. (2005) document that training has a direct influence on PEU. As the training will also present the features of the system for the students, it is believed that training will affect perceived usefulness of MS Teams. Therefore, H16 and H17 hypotheses are defined as:

H₁₆: *(Tr) will positively affect (PU).*
H₁₇: *(Tr) will positively affect (PEU).*

Perceived Community Building (PCB) is defined by (Islam, 2013) as "User perception of the extent to which they believe an e-learning system will actually assist them in building a social community". Zhao et al. (2012) documented that social communities can be built though any collaborative information system. MS Teams can be seen as a collaborative LMS as it contains several interaction services helping students to interact with each other and with their educator, which in turn, assist in building relationships and social community. Islam (2013) studied PCB as a construct that is affected by PU and PEU. In this research, it is believed that MS Teams helped in building social communities between students during their sharing ideas and solutions for shared assignments. Students are also communicating for knowledge transfer and asking each other questions related to courses. Moreover, the discussions between students as a result of building community may include discussing easy ways to perform tasks in MS Teams. In this notion, it is believed that PCB affects the PEU directly. Based on that, it is decided to consider PCB as a source construct that influence PU and PEU instead of being influenced by them as introduced by Islam (2013). Thus, the following hypotheses are proposed:

H₁₈: *(PCB) will positively affect (PU).*
H₁₉: *(PCB) will positively affect (PEU).*

Internet Connectivity (IC) can be defined in the context of this research as the ability of students to access MS Teams over the Internet without suffering disconnection or unstable connection. It is believed that this construct affects the use of the LMS. Bad connection was, and still is, facing students and lecturers during online lectures, uploading and downloading materials and assignments, and communication between each other. Throughout literature reviewed, this construct was not introduced as a construct affecting the use of an LMS. This either because the research conducted before was in developed countries where the Internet and communication infrastructure is able to handle high traffic or because it is conducted under normal life conditions instead of being in a pandemic. When the student has unstable connections for several times, it is believed that the student will disfavor to use the LMS with doubt of its usefulness. The student may also not have the opportunity to practice the system fully which gives the feeling of difficulty to use the system. Based on that, the following hypotheses are proposed:

H₂₀: *(IC) will positively affect (PU).*
H₂₁: *(IC) will positively affect (PEU).*

4. Materials and Methods

4.1 Sample Characteristics

The survey of this study was conducted at two different private universities in Jordan. These two Universities were chosen because they adopted Microsoft Teams system as a teaching platform for distance learning during the COVID-19 pandemic. All the students at all faculties in both Universities were given access to MS Teams system and enrolled at their courses through their lecturers. The students enrolled in the survey are studying at different faculties (Faculty of Information Technology, Faculty of Administrative & Financial Sciences, and Faculty of Engineering, in specific) and at different bachelor levels (from level 1 to level 5). Both Universities were using an LMS before the pandemic, meaning that all the students were already using a different LMS before shifting to MS Teams system. Even 1st year students were using an LMS before MS Teams since the distance learning, enforced by the government, started during the second semester of their university study.

4.2 Data Collection

An online questionnaire was prepared using Google forms. A 5-point Likert scale, ranging from, 1: strongly disagree to 5: strongly agree, was used to collect the answers of students on questions. Some questions were inverted (presented negatively)

to avoid the bias. Although both Universities are using English as their instruction language, questions and answers were translated to Arabic to increase the understanding. The questions used, in English language, and the references adopted from are listed in Appendix A. All students were subjected to the same form and same questions. Two pilot studies on two students were conducted to ensure the understandability of the questions and to estimate the time required to fill the form, which was around 7-10 minutes and was mentioned in the form.

The form was distributed over 5 students' online groups, including social media groups for the two universities students, with a description clarifying the purpose of the study. The questionnaire reached more than 500 students (534) of both genders. At the time of distributing the questionnaire, the students were practicing MS Teams for two semesters, the second (winter 2020) and the third (summer 2020). The data was collected after two weeks of distribution.

5. Analysis and Results

5.1 Participant demographics

Initially, the questionnaire was sent to 534 students at both universities. A total sample of 396 students answered the questionnaire from both Universities. That is about 74% of the students responded by filling it up. 226 students 57% of the participating students are males while 170 students 43% are females. All the students answered all the questions and none of the participants was excluded. As some questions were presented negatively (9 questions out of the 38 questions) to avoid bias, their answers were reversed in the resulting Excel sheet before starting the data analysis. There was no question asking the students about their specialization (IT, Business, or Engineering). This is because the researchers believe that the student specialization would not help the aim of the research. It is believed that research that may interest in specializations should include more than 3 faculties. This could not be conducted in this research due to the lack of accessibility to other faculties and permissions required to conduct the experiments on all the universities faculties. For the purpose of analyzing results and evaluating the research model hypothesis of this research, Structural Equation Model (SEM) was used because of its ability to model relationships between multiple dependent and independent variables at the same time, as introduced by (Byrne, 2016), which is needed in this research. SPSS Amos version 24 is used for SEM analysis because of its effectiveness over the multiple regression analysis (Cheng, 2001).

5.2 Reliability Analysis

Table 2 presents Cronbach's Alpha values. All the variables' values are between (0.764 and 0.906) which are in acceptable range. Presented results show that items in this scale are consistent with each other.

Table 2
Reliability analysis of variables

Variables	M	SD	Skewness	Kurtosis	Cronbach's Alpha
Social Norm	3.12	1.10	-0.18	-0.83	0.84
User Interface Design	3.12	1.02	-0.10	-0.81	0.77
Computer self-efficacy	3.23	1.11	-0.27	-0.93	0.84
Internet Connectivity	3.27	1.02	0.00	-0.94	0.79
Training	2.97	1.00	0.01	-0.74	0.80
Perceived Community Building	3.27	1.09	-0.54	-0.47	0.89
Technical Support	3.15	0.96	0.13	-0.80	0.76
Perceived Usefulness	2.87	0.83	0.10	-0.34	0.88
Perceived Ease of Use	3.4	1.04	-0.55	-0.24	0.91
Attitude	2.84	1.08	0.11	-0.82	0.81
Behavioral Intention to Use	2.60	1.19	0.15	-1.06	0.86

5.3 Confirmatory Factor Analysis

Assessment of Normality

Table 2 shows the results of skewness and kurtosis. The kurtosis and skewness values for factors should be between (−3 and 3) to judge that data is normally distributed (Byrne, 2016). The resulted values of kurtosis are between (-1.06 and -0.24), and the values of skewness are between (-0.55 and 0.15). This indicates that the collected data is normally distributed.

Factor Loadings (FL)

Studies (Ahmad & Ward, 2016; Escobar-Rodriguez & Monge-Lozano, 2012; Kilic, 2014; Park, 2009) cite that the recommended factor loading should be 0.50 or higher while (Ahmad & Ward, 2016; Karahanna et al., 2006) introduced that the ideal LF should be 0.70 or higher. Based on that, the variables FL with values less than 0.5 should be dropped to get valid results. None of the factor loading results was less than 0.5, accordingly, all the questions were considered. However, factor loading values for IC1, IC3, Tr2 and PU1 were between 0.6 and 0.7 which is less than the recommended value ($>= 0.7$) but they are within the acceptable range. Table 3 also shows the calculated factor loading squared, measurement errors and p-values. All the resulted values found to be significant with p value < 0.001.

Table 3
Confirmatory factor analysis results

Latent Variable	Indicator	FL	FLS	S.E.	p-value	CR	AVE
SN	SN1	0.757	0.573		-		
	SN2	0.865	0.748	0.055	<0.001	0.84	0.64
	SN3	0.773	0.598		<0.001		
UID	UID1	0.724	0.524		-		
	UID2	0.744	0.554	0.069	<0.001	0.77	0.53
	UID3	0.707	0.500		<0.001		
CE	CE1	0.801	0.642		-		
	CE2	0.758	0.575	0.056	<0.001	0.84	0.63
	CE3	0.820	0.672		<0.001		
IC	IC1	0.663	0.440		-		
	IC2	0.909	0.826	0.083	<0.001	0.79	0.56
	IC3	0.653	0.426		<0.001		
Tr	Tr1	0.792	0.627		-		
	Tr2	0.662	0.438	0.058	<0.001	0.80	0.58
	Tr3	0.814	0.663		<0.001		
PCB	PCB1	0.839	0.704		-		
	PCB2	0.781	0.610	0.046	<0.001	0.89	0.68
	PCB3	0.863	0.745		<0.001		
	PCB4	0.800	0.640		<0.001		
TS	TS1	0.701	0.491		-		
	TS2	0.701	0.491	0.067	<0.001	0.76	0.52
	TS3	0.757	0.573		<0.001		
PU	PU1	0.619	0.383		-		
	PU2	0.733	0.537		<0.001		
	PU3	0.818	0.669	0.042	<0.001	0.88	0.55
	PU4	0.584	0.341		<0.001		
	PU5	0.734	0.539		<0.001		
	PU6	0.918	0.843		<0.001		
PEU	PEU1	0.916	0.839		-		
	PEU2	0.825	0.681	0.037	<0.001	0.91	0.72
	PEU3	0.872	0.760		<0.001		
	PEU4	0.774	0.599		<0.001		
At	At1	0.772	0.596		-		
	At2	0.709	0.503	0.066	<0.001	0.81	0.59
	At3	0.813	0.661		<0.001		
BIU	BIU1	0.869	0.755		-		
	BIU2	0.861	0.741	0.055	<0.001	0.86	0.68
	BIU3	0.736	0.542		<0.001		

(-) Not estimated as loading set to fixed value of 1.0, FL = Factor Loading, FLS = Factor Loading Squared, S.E. = Standard errors of the regression weights

Constructive Validity

Constructive validity describes the results of convergent validity (CV) and discriminant validity (DV) (Byrne, 2016). CV can be measured through Composite Reliability (CR) and Average Variance Extracted (AVE). According to Ahmad and Ward (2016), Escobar-Rodriguez and Monge-Lozano (2012) and Kilic (2014) CR and AVE values should be higher than 0.7 and 0.5 respectively. Table 4 shows the resulting values for CR and AVE which are above the threshold for all the measured variables. According to Ahmad and Ward (2016) and Escobar-Rodriguez and Monge-Lozano (2012), DV can be measured by comparing AVE square root values and correlations of constructs values. For acceptable DV, AVE values, marked as bold in Table 4, should be higher than the correlation values, which are the values to the left and below the bolded values in Table 4.

Table 4
Convergent and discriminant validity values

	CR	AVE	SN	UID	CE	TS	Tr	PCB	IC	PU	PEU	At	BIU
SN	0.84	0.64	**0.80**										
UID	0.77	0.53	-0.45	**0.73**									
CE	0.84	0.63	0.66	-0.77	**0.79**								
TS	0.76	0.52	-0.65	0.40	-0.50	**0.72**							
Tr	0.80	0.58	0.62	-0.50	0.73	-0.49	**0.76**						
PCB	0.89	0.68	0.71	-0.59	0.71	-0.47	0.69	**0.82**					
IC	0.79	0.56	-0.06	0.20	-0.03	0.04	0.15	-0.002	**0.75**				
PU	0.88	0.55	0.09	-0.20	0.16	-0.02	0.002	0.13	-0.14	**0.74**			
PEU	0.91	0.72	0.53	-0.62	0.72	-0.31	0.58	0.61	-0.11	0.05	**0.85**		
At	0.81	0.59	0.63	-0.45	0.50	-0.57	0.45	0.52	-0.23	0.31	0.48	**0.77**	
BIU	0.86	0.68	0.73	-0.52	0.70	-0.52	0.67	0.77	-0.04	0.10	0.61	0.65	**0.82**

Clearly, as Table 4 presents, all the DV values are acceptable. For extra DV study and to ensure that each construct is different from the other and measuring the degree each construct is overlapping with one another, Heterotrait-Monotrait (HTMT) ratio of correlation test, introduced by Henseler et al. (2015), was conducted. As the correlation values approach 1.00, this indicates lower discriminate validity of the results. For HTMT, Kline (2016) proposed the threshold value of 0.85. As can be seen in Table 5, all the values are below the threshold value which indicates a high discriminate validity of the variables.

Table 5
HTMT Analysis

	SN	UID	CE	TS	Tr	PCB	IC	PU	PEU	At
SN										
UID	0.445									
CE	0.663	0.760								
TS	0.629	0.405	0.512							
Tr	0.606	0.475	0.709	0.491						
PCB	0.727	0.598	0.712	0.485	0.688					
IC	0.008	0.122	0.067	0.006	0.195	0.052				
PU	0.092	0.228	0.183	0.023	0.006	0.144	0.119			
PEU	0.547	0.643	0.750	0.341	0.594	0.643	0.026	0.045		
At	0.619	0.454	0.504	0.558	0.440	0.538	0.202	0.307	0.501	
BIU	0.728	0.526	0.702	0.515	0.632	0.765	0.005	0.092	0.624	0.645

5.4 Model fit values for measurement model

For the model fit analysis:

SEM generates that chi-squared/degree of freedom value is 2.899 which is acceptable as it is <= 3.0 according to Ros, et al. (2015), Sánchez and Hueros (2010) and Tarhini et al., 2014). The Goodness of Fit (GFI) value is 0.806 which is acceptable as it is >= 0.8 according to Chang and Tung (2008). The Comparative Fit Index CFI value is 0.872 which is not acceptable as it should be >= 0.9 according to Byrne (2016), Ros et al. (2015), Sánchez and Hueros (2010) and Tarhini et al. (2014). However, it is very close to the acceptable value. The Normed Fit Index NFI value is 0.819 which is acceptable as it is >= 0.8 according to (Ros, et al., 2015). Finally, the Root Mean Squared Error of Approximation (RMSEA) value is 0.069 which is acceptable as it is <= 0.08 according to Sánchez and Hueros (2010) and Tarhini et al. (2014). According to the results above, an acceptable model fit is achieved.

5.5 Hypothesized structural model

Table 6 shows the regression weights values and p-value for each relation between the variables. It is clear that the relations SN-PU (H7) and TS-PU (H14) are not significant as their p-values are higher than 0.05. Accordingly, H8 and H16 are rejected (not supported). Meaning that, (SN) has no effect on (PU) and (TS) has no effect on (PU). The hypotheses (H1, H3, H4, H6, H8, H9, H10, H11, H12, H13, H17 and H19) are significant at the alpha level of 0.01 and the hypotheses (H2, H5, H15, H16, H18, H20 and H21) are significant at alpha level of 0.05. After the SEM analysis, the final best fitting model can be found in Fig. 3.

Table 6
Results for the hypothesized relationships

Hypothesis	Relationship of Constructs			Path Coefficient	p-value
H1	BIU	←	At	0.370	<0.001
H2	BIU	←	PU	0.105	0.031
H3	At	←	PU	0.312	<0.001
H4	At	←	PEU	0.432	<0.001
H5	PU	←	PEU	0.182	0.018
H6	BIU	←	SN	0.441	<0.001
H7	PU	←	SN	0.063	**0.263**
H8	PEU	←	SN	0.141	0.004
H9	PU	←	UID	0.162	0.010
H10	PEU	←	UID	0.239	<0.001
H11	PU	←	CE	0.236	<0.001
H12	BIU	←	CE	0.406	<0.001
H13	PEU	←	CE	0.460	<0.001
H14	PU	←	TS	0.076	**0.197**
H15	PEU	←	TS	0.115	0.026
H16	PU	←	Tr	0.146	0.014
H17	PEU	←	Tr	0.202	<0.001
H18	PU	←	PCB	0.119	0.035
H19	PEU	←	PCB	0.213	<0.001
H20	PU	←	IC	0.123	0.031
H21	PEU	←	IC	0.118	0.016

6. Conclusions and Discussion

Microsoft Teams System (MS Teams) is one of the used Learning Management Systems (LMSs) during the COVID-19 pandemic as the only available way of teaching at some higher education institutions in Jordan. The acceptance of MS Teams by students have been examined in this research. Several factors motivated this research. The first is that very little research has been conducted to evaluate the acceptance of students to new LMSs during the pandemic. The second is that no research, according to the researchers' knowledge, has been conducted to evaluate the student acceptance of MS Teams in Jordan neither before nor during the pandemic. Authors such as Hölbl and Welzer (2010) encouraged exploring the students' acceptance for new technology in the field of education in different countries. Moreover, a new variable, Internet Connectivity, that has not been studied in the field to LMSs students' acceptance evaluation, studied in other fields however, is introduced in this research. Technology Acceptance Model (TAM) is used to evaluate the students' acceptance for the new technology, MS Teams, as an LMS.

Throughout this study, 7 external variables are used and tested. They are, Social Norm (SN), User Interface Design (UID), Computer Efficacy (CE), Technical Support (TS), Training (Tr), Perceived Community Building (PCB) and Internet Connectivity (IC). All the variables are found affecting, either directly or indirectly through the original TAM variables, the acceptance of students and their intention to use MS Teams as an LMS during the pandemic. The only two rejected hypotheses that are not supported by the introduced model are "SN affects PU positively" and "TS affects PU positively".
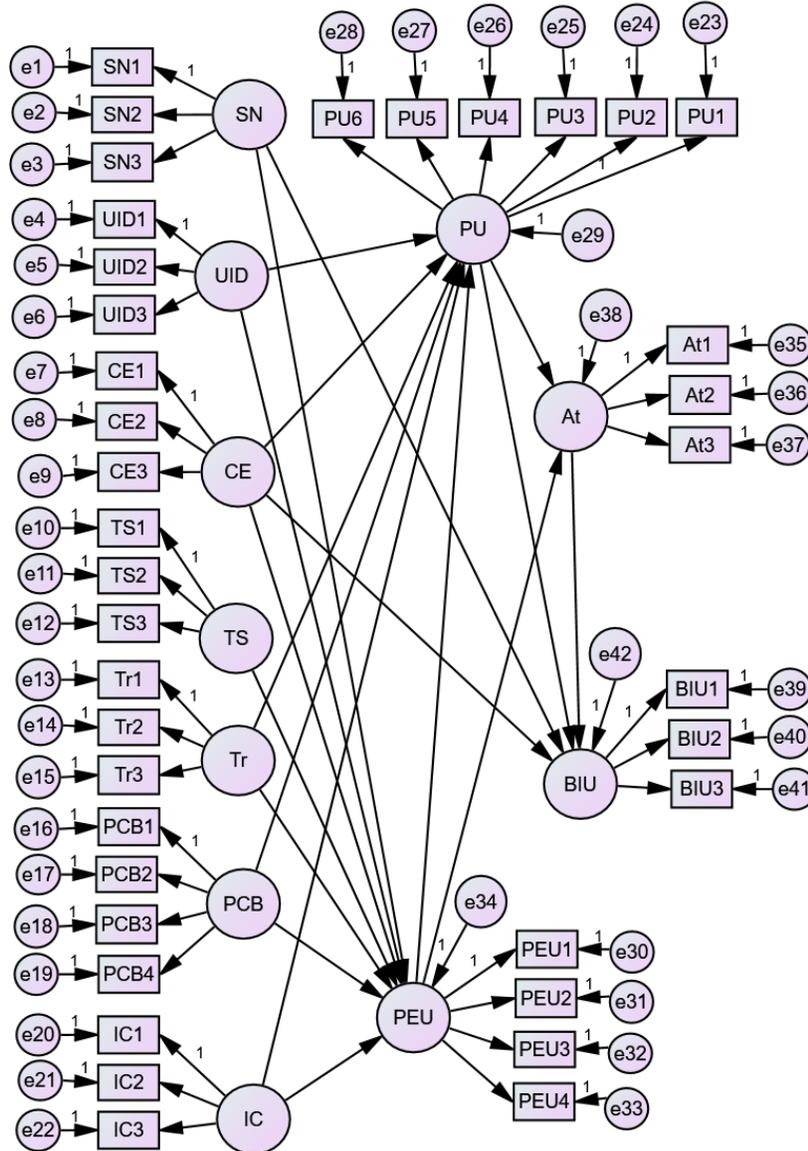

Fig. 3. Final best fitting structural model

Results show that SN does not affect the Perceived Usefulness (PU) of MS Teams although it is significantly affecting the Perceived Ease of Use (PEU) and directly affecting the Behavioral Intention to Use (BIU) of the same system. These results are contradicting with those found by (Karahanna et al., 2006; Kilic, 2014; Sánchez & Hueros, 2010; Yalcin & Kutlu, 2019) who found that UID affects both, PU and PEU, positively. Although it is believed that MS Teams has a good and friendly user interface design, it is also believed that students still need time to be familiar with the interface. This can be one justification for not supporting the relation between SN and PU by the model. One more explanation is that whether the student likes the interface or not, during the pandemic, s/he must use the system. In other words, during situations such as the pandemic, the SN would not add a value for the student regarding the usefulness of the system as the usefulness feeling is coming stronger from other factors. Results show that social norms positively affect the students' behavioral intention to use the system during the pandemic. These results conform with Sánchez and Hueros (2010), Yalcin and Kutlu (2019), Ahmad and Ward (2016) and Tarhini et al. (2015) findings during normal (not pandemic situations).

Regarding the UID, results show that it affects positive intention to use though positive effect on the PU and PEU. These results are logical as the friendly user interface, which is believed that it is a character of MS Teams, makes it easier to use and more useful as the student can use most, if not all, its available features. CE affects positively the PU, PEU and directly the BIU. This is expected and it is classified as one of the most important factors that affects the intention to use a new LMS by Sánchez and Hueros (2010). The results in this case were expected because all the participating students already were using other LMSs before being transferred to MS Teams.

The results gained from the experiment show that TS does not affect PU. This is an unexpected result. The students throughout the pandemic period, were supported technically by several parties including the university computer center and the faculty members. This should have given the students the feeling of being able to use all the features of MS Teams, which should in turn, give the feeling of usefulness of MS Teams. However, this was not the case. Maybe the students were facing problems and felt lazy to ask so they did not get the value of technical support. Maybe also the technical support took a long time for some reason or another and the students do not get benefit of it properly. On the other hand, technical support is positively affecting the PEU which is logical as it is solving the problems of using MS Teams. The students were given training on MS Teams through recorded videos, published on universities websites, that the students can refer to at any time. This training affects the PEU and PU positively. PCB, which is represented by the communities built by the students including groups on social media, such as WhatsApp groups, positively affects the intention to use MS Teams during the pandemic. It is recognized by the authors of this research that the students were helping each other by solving some problems of using the system. Finally, the quality of internet connection (IC), affected the PU and PEU positively. These results were found to be logical as if the Internet connection is stable and with high quality, then the student feels that the system is easier to use. Moreover, stable connection gives the students the ability to use the system functionalities and perceives its usefulness. This means that IC is an important factor that should be considered at research during the pandemic situations especially in developing countries like Jordan.

As a general conclusion, practically, using and encouraging the use of MS Teams by colleagues and lecturer will not affect the belief of students with the value of it as an LMS. Actually, this can be also translated as, whether socially influencers used the system or not, the student must use it during the pandemic which could be the actual factor for the usefulness of the system regarding the students. This may give a finding for this study which is that, at enforcement conditions, some relations will be insignificant as they are in the normal conditions. However, such a claim needs more research. Practical results also can be generalized to state that during specific situations such as the pandemic and normal conditions, social norm gives the users a feeling of the importance of the system and encourages using it. Moreover, the user interface has an effect on how well we use the system equally during normal and specific conditions (the pandemic). As a general conclusion, during the pandemics using online LMS will be successful under the circumstances of availability of strong infrastructure that support heavy traffic of the online communication. If the LMS is new, then the most important factors are the user interface design, computer efficacy, availability of training, and finally, the availability of communication through the LMS itself to improve the perceived community building. These factors, which affect the perceived usefulness and the ease of use of the system which in turn, affect positively the behavioral intention to use the system.

7. Limitations and Future Work

One of the limitations of this research is that it is limited to only two Universities in Jordan. Although the results can be generalized, further similar research with the same variables can be conducted to confirm the generalization ability. Another limitation that includes the generalization is that the study was conducted in Jordan only and the results cannot be generalized globally or on developing countries.

The results also are limited to using MS Teams as an LMS and further studies required for each LMS used such as Moodle and other private LMSs. Finally, it is believed that the results are threaten by the fact that the students are forced to use MS Teams during the pandemic as the only way of learning. This requires further studies to evaluate the acceptance of MS Teams after the pandemic.

One of the important future work that can be done is to study the acceptance of MS Teams during the pandemic based on the gender and specialization of students. This study has the limit of not analyzing these two factors, however this was because the limited number of faculties surveyed as a result of lack of accessibility to students' online groups and permissions required to conduct the experiment on other students' faculties.

Compliance with ethical standards

Conflict of interest: The authors declare that they have no conflict of interest.

The data used for this research is available at:
https://docs.google.com/spreadsheets/d/1mmlNK6iuERdk68YNDgsEEMJwx6Xt4j4G/edit?usp=sharing&ouid=103762612852700797044&rtpof=true&sd=true

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Appendix A: Constructs and Items

Social Norm (SN)

SN1: My instructors think that it is important to use MS Teams system.
SN2: Other students think that it is important to use MS Teams system.
SN3: My close friends at University think that it is important to use MS Teams system.

User Interface Design (UID)

UID1: GUI layout and design in MS Teams system is not user-friendly.
UID2: Overall, MS Teams system user-interface design is satisfactory.
UID3: The layout design of the MS Teams system makes it easy to read.

Computer Self-Efficacy (CE)

CE1: I can access the learning contents of MS Teams system easily.
CE2: I can handle problems that arise on MS Teams system.
CE3: Overall, I am able to use MS Teams system.

Internet Connectivity (IC)

IC1: I have problems with MS Teams system because of Internet connection.
IC2: Internet Connection quality at home enables me to perform all my work on MS Teams System efficiently
IC3: Internet Connection quality at home guarantees that all the required work such as uploading assignments, attending lectures and making exams have been completed

Training (Tr)

Tr1: The kind of training provided to me through recorded videos about MS Teams system was sufficient.
Tr2: My level of understanding about MS Teams system was not improved after going through the training program.
Tr3: The training gave me confidence in MS Teams system as a learning management system.

Perceived Community Building (PCB)

PCB1: MS Teams system provides opportunities to establish personal contact with teachers
PCB2: MS Teams system allows me to contact teachers in more flexible way.
PCB3: MS Teams system makes it easy to do group work.
PCB4: MS Teams system provides opportunities to establish new contacts with other students

Technical Support (TS)

TS1: MS Teams system provides assistance when there is a technical problem.
TS2: Hotlines are available when support is needed (either through technicians or lecturers).
TS3: E-mail enquiries are difficult be made when there is a technical problem.

Perceived Usefulness (PU)

PU1: Using MS Teams system allows me to accomplish learning tasks (such as adding comments, submitting assignments and conduct exams) more quickly
PU2: Using MS Teams system does not help in improving my performance in learning
PU3: Using MS Teams system makes it easier to learn course content
PU4: Using MS Teams system limits my productivity in learning
PU5: MS Teams system helps me following up my learning activities as it can be available in my work or leisure place.
PU6: Overall, using MS Teams system is advantageous in learning.

Perceived Ease of Use (PEU)

PEU1: Interacting with MS Teams system requires a lot of mental effort.
PEU2: I find it easy to get MS Teams system to do what I want it to do.
PEU3: The process of using MS Teams system is not clear nor understandable.
PEU4: It is easy to get learning materials from MS Teams system.

Attitude (At)

At1: Using MS Teams system is a good idea.
At2: It is fun to learn using MS Teams system.
At3: The MS Teams system is an attractive way to learn.

Behavioral Intention to Use (BIU)

BIU1: If possible, I intend to use MS Teams even I return back to class study (in communication with lecturers and students as an example)

BIU2: In general, I plan to use MS Teams system frequently for my coursework and other activities in the next semester.

BIU3: In the future, I will use MS Teams system only when I am forced to