How does Covid-19 disrupt traditional success models: The case of e-learning

Michel Plaisent
University of Quebec at Montreal, Canada, plaisent.michel@uqam.ca

Asli Gül Öncel
Galatasaray University, İstanbul , Turkey, aoncel@gsu.edu.tr

Daniel Tomiuk
University of Quebec at Montreal, Canada, tomiuk.daniel@uqam.ca

Youne Benslimane
York University, younes@yorku.ca

Cataldo Zuccaro
University of Quebec at Montreal, Canada, zuccaro.cataldo@uqam.ca

See next page for additional authors

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Authors

Michel Plaisent, Asli Gül Öncel, Daniel Tomiuk, Youne Benslimane, Cataldo Zuccaro, and Prosper Bernard

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Michel Plaisent [1,*]
Asli Gül Öncel [2]
Daniel Tomiuk [3]
Younes Benslimane [4]
Cataldo Zuccaro [5]
Prosper Bernard [6]

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*Corresponding author
[1] Professor, University of Quebec at Montreal, Montreal, Montreal, Canada, plaisent.michel@uqam.ca
[2] Associate Professor, Galatasaray University, İstanbul , Turkey, aoncel@gsu.edu.tr
[3] Professor, University of Quebec at Montreal, Montreal, Canada, tomiuk.daniel@uqam.ca
[4] Associate professor, York University, younes@yorku.ca
[5] Professor, University of Quebec at Montreal, Montreal, Canada, zuccaro.cataldo@uqam.ca
[6] Professor, University of Quebec at Montreal, Montreal, Canada, Bernard.prosper@uqam.ca

ABSTRACT

This paper questions the prevalent approach in assessing the value of e-learning through the information system model. A recall is made of the evolution of DeLone and McCain model and other theory at the basis of such assessment, namely TAM derived models and performance models. In these years of covid which imposed e-learning on schools, without adequate preparation this examination is more than ever important since it changes the logic of the assessment. The covid19 caused an unvoluntary use of e-learning that questions the validity of prevalent models. An integrated model, which take this aspect into consideration, is proposed in this article, to be validated empirically in a soon future.

Keywords: Covid-19, Delone and McLean, IS success model, e-learning, performance, satisfaction, e-readiness, teacher readiness.

INTRODUCTION

Lately, several newspapers have reported on the deaths of young people engaged in e-learning due to Covid-19. They took their own lives because they could not deal with the stress of online sessions (Nath, 2020). Many experienced on-line learning difficulties or technological functionality problems (Recana, 2020). This, namely, suggests that the decision to generalize e-learning approach, advocated as the only solution and introduced wall-to-wall as a global response to the pandemic crisis should be revisited since it may pose problems (Taravulea et al., 2020), namely (but not only) in regards of student mental health and student confidence to get a job degree and a job based on the credibility of this one (Mohapatra, 2020).

E-learning adoption is not a new phenomenon. Along with a pedagogical battery of tools such as active learning, flipped classrooms, 21st century skills development, artificial intelligence, virtual reality, etc., e-learning has today achieved a huge sales market (Koksal, 2020). The main advantages of e-learning are well known, namely, easier access to learning and flexibility over time and space, enhanced and empowered learning, time savings, improved and faster feed-back (Holsapple & Lee, 2006; Ismuratova, 2020; Ng et al., 2020; Popa, 2020). In their systematic review, Choudhury & Pattnaik (2020) provide a exhaustive list of 43 such advantages from several points of view (i.e., from students', teachers', institutional and societal perspectives).

These advantages are mitigated by some negative aspects. These include social isolation, quality concern (Hodges et al., 2020) and other disadvantages such as limited feedback, difficulty in preventing cheating, limited adaptability for some disciplines, teachers favouring theory over practice, requiring e-readiness from students (Tamm, 2019). From a review of 138 articles, Choudhury & Pattnaik (2020) add ten more disadvantages, namely, transactional distance, misinterpretations, lack of body language, digital divide, lack of cohesiveness and connection between students, and blurring the difference between school and home.

The move to emergency online teaching due to Covid-19 also added many challenges; the suddenness of its introduction, the burden it brought on schools' management, the disruption of existing pedagogy and the lack of concern for the consequences for students and for teachers, with many having to improvise online teaching solutions with limited help and guidance from their schools (Bao, 2020; Green, 2020; Hodges et al, 2020; QS, 2020; Elkhannoubi et al., 2022). Teachers were expected to redesign their courses almost overnight. Many did not have sufficient time, energy or knowledge to do so adequately. Mandatory social distancing measures and temporary physical closures of school also meant that students were forced into

online classes (Cheong et al., 2020; Greene, 2020; Mohapatra, 2020). Even teaching institutions were unprepared and experienced many difficulties in supporting online student assessment alternatives (Sharadgah & Sa'di, 2020).

During the pandemic, e-learning was implemented suddenly, in response to the need to provide education to all students, eliminating their physical, in-class presence. To continue serving and providing education to their customers, schools and universities introduced online learning haphazardly, without much notice, training or support, in response to the pressure of covid-19. The scale of this change was unprecedented and its pace astonishing (Hodge et al, 2020; The Chronicle of High Education, 2020). In many institutions, e-learning was imposed as the "unique" available solution, eliminating the need or the usefulness of discussion. According to QS (2020), 74% of institution shifted some or their courses online, 39% changed the deadlines for application/registration, 31% had to delay some course offerings and 32% had to reschedule course start dates.

According to UNESCO (2020), most governments had to close institutions to fight covid-19, affecting almost one billion students worldwide. Regarding China's policy of suspending regular classes in favour of online teaching, Zhang et al. (2020) identifies five problems:
i)   Lack of an adequate infrastructure;
ii)   Online resources were not spread equally and available resources were not well-known or mastered;
iii)   Limited instructors' skills and experience with IT hindered their capacity of effective teaching;
iv)   Students and teachers both needed to have the ability and lifestyle adequate to learn/teach from home;
v)   There was no clear guide about what was a good pedagogy and transmission modality.

It may still be too soon to fully comprehend the full impact that the decision to go online had on institutions' finances, students' academic performance, employees' and teachers' moral and stress given the pressure to develop, implement and support, mass virtualization of courses for IT personnel.

The underlying/implicit expectation about successful e-learning is that teaching, and delivery of instruction are well planned ahead of time, and it can take place if and only if, emergent initiatives are built on robust foundations (Hodges, 2020).

In this paper, the authors examine if, during the Covid-19 period, four (4) pillars which are reputed to sustain e-learning success in the traditional view were considered: (a) student e-readiness, (b) teacher e-readiness, (c) organization e-readiness and (d) system e-readiness. Most of the literature on e-learning explores one or a mix of these constructs. This research report is an investigation on how each of these four pillars of e-learning was challenged by the pandemic. We question the adequacy of the models to describe success, in these disruptive times, from the perspective of the main actors, the students. All together, they are representative of past work on e-learning, when it was still a voluntary choice for students, teachers, education IT developers, education managers and organizational decision-makers.

The rest of this paper is divided into 5 sections. The first recalls the main success models for information systems and their potential application to e-learning. The second reorganizes the previous knowledge in the light of the four pillars of a successful e-learning usage in normal contexts (i.e., student e-readiness, teacher e-readiness, system e-readiness and institution e-readiness). The third section presents an e-learning success model with special consideration for the covid on the normal flow of interactions between constructs. In the fourth section, a methodology to challenge this new integrative model is discussed before the Data analysis section. Finally, a discussion and conclusion is drawn after some discussion no the results.

2. Background

E-learning is often called "distance learning" (Holsapple & Lee-Post, 2006). Choudhury and Pattniaik (2020) conducted an impressive systematic review of 138 articles (out of an initial list of 976) from the most relevant journals. They found definitions for e-learning ranging from the transfer of know-how using technology to using technologies to dispense curriculum. Their purpose was to critically examine the advantages, and disadvantages, the challenges and critical success factors, and the theories and models used to examine e-learning. Their review provides a profound view on the evolution of these themes with the evolution of internet, from web 1.0 to web 4.0. They also identified the main stakeholders in e-learning. These are; learners, instructors, the learning institutions, content developers, technology providers, accreditation bodies, and even the learners' employers (or future employers).

2.1 Quest for dependent variables to assess success

In her extensive literature review, Dorobat (2014) identified four main approaches used to assess the success construct in the context of e-learning: a) those based on the DeLone and McLean (D&M) model with its extensions (net benefits); 2) those based on the Technology Acceptance Model (TAM); 3) models focused on users' satisfaction; and 4) models focused on quality and performance.

2.1.1 Approaches based on the Delone and McLean model

References to the 1992 Delone and McLean model (D&M) are still abundant nowadays. They are based on D&M model's original specification or on some adaptation of it. It has been the prevailing model of system success, where characteristics of the system (system and information quality) affect use and user satisfaction. This then leads to an individual impact which, in turn, is expected to translate into beneficial organizational impacts (see Figure 1).
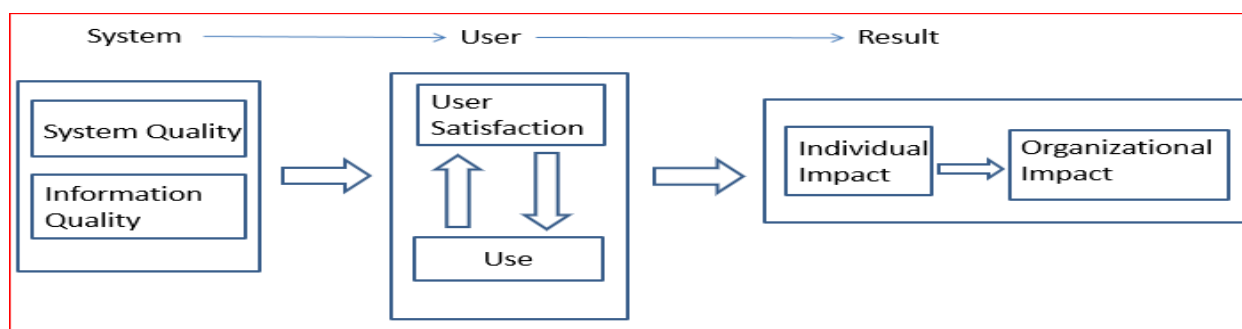
Figure 1: Delone & McLean (1992) I/S success Model

In their initial model, based on 180 articles, success is a positive organizational impact which is the resultant combination of the individual positive impacts of mutually reinforcing concepts; use and satisfaction. Use leads to satisfaction which, in turn, reinforces system usage. This pair of variables is determined by the combined quality of the system and the quality of information. This model may be better adapted to a time when many people feared using computers, and use was primarily in the context of producing information for organizational decision-making or transaction processing. Satisfactory computer use naturally leads to more efficiency from individuals which explains the subsequent positive organizational impact, seen here as the summation of many individual impacts.

Seddon (1997) presented a critical examination of the D&M model, arguing that the "use" construct was misconceived as a proxy for benefits from use. Instead, it is more adequate to consider it a behavior rather than a measure of success. As a behavior, "use" should be a conceptualized as a consequence of expectations and beliefs. Given actual use, the author argues that system quality and information quality could result in perceived usefulness and user satisfaction (two perceptual measures of benefits) and that these benefits could be valuable in understanding how information systems' impact individuals, organizations and even society.

A paper by Rai et al. (2002), aimed at assessing the validity of both models from data collected among 274 system users. Their study validated both models. However, the authors noted a problem with the notion of system use that they interpreted as being dependent on the system whereas user satisfaction is included as an "individual impact". Seddon's model incorporated the notion of system dependency which results from user satisfaction with the actual use of the system. Also, they changed the concept of system quality into the ease of use construct in both models, as a surrogate.

Despite its wide acceptance, criticisms to the original D&M model began to appear over time. Consequently, ten years later, the authors felt it necessary to update it (Delone & McLean, 2003). They proposed "enhancements" and "minor refinements" to the initial model, to consider a full decade of research that applied, attempted to validate, and challenged the initial model and proposed enhancements to it. Also, taking in consideration TAM (Technology Acceptance Model – Davis, 1989) research in which intention to use is modelled as a prerequisite to use, they also included that construct in their model, but kept the system quality construct instead of the "ease of use-friendliness" as suggested by Rai et al. (2002).

Following the lead of the end-user paradigm, specifically in the case of e-commerce, Delone and McLean incorporated a version of the ServQual construct (see Parasuraman et al., 1985). They kept an emphasis on "use" arguing that:
"(while) most studies that follow D&M replace the Use box with Usefulness ..., we prefer to maintain Use as in the original work. (…) We (…) believe that use, especially informed and effective use, will continue to be an important indication of IS success for many systems" (p.17).

However, their new model did not include the perceptual measure of usefulness as suggested by Seddon (1997). The new model separates intention to use from use, which was an important decision according to Mardiana et al. (2015) as it allows links with TAM and other acceptance models.

Finally, to accommodate more different contexts, the authors merged individual and organizational impacts into a new construct, which they called net benefits. Their updated model does not prescribe a formal definition of net benefits. This was to allow for the context and the purpose of the system to help define how to measure its impacts. That construct is congruent with Seddon's (1997) three points of view about measures of benefits: for the organization (costs of delivery, flexibility to time and space markets, etc.), for individuals (teachers and students) and for society. The resulting updated model, often named "Information System Success Model", in short ISSM, is presented below:
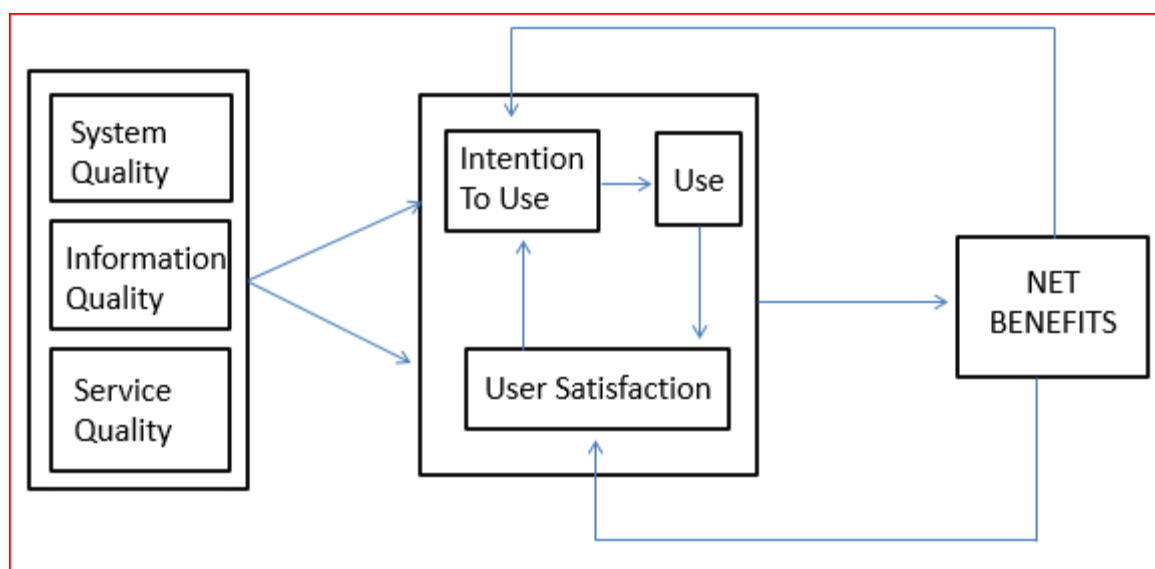
Figure 2: Delone & McLean (2003) updated model

2.1.2 Other models inspired from Delone & McLean

The ISSM has been adapted in many other contexts by researchers, namely to e-learning. Table 1 summarizes the most relevant:

Table 1: Main studies relying on the Delone & McLean models

Authors (year) /context	Independent variables	Intervening variables	Dependent(s)
Gunesekera (2020) - Meta-analysis of 37 studies on ISSM	- ISSM variables - Potentially Education quality, perceived usefulness & ease of use, self-efficacy, usability, efficiency, reliability	All ISSM model	Net benefits
Yakubu & Dasuki (2018)	Service quality, system quality, information quality	User satisfaction Behavioral intention	Actual usage
Seta et al. (2018)	- Technical system quality - Educational system quality - Service quality - Content and information quality	- Use - User perceived satisfaction	Individual impact
Ramirez-Correa et al. (2017)	ISSM model	ISSM variable	Net benefits, learning style is moderating
Chang et al. (2017)	Subjective norm, enjoy experience, computer anxiety, self-efficacy	- Perceived usefulness - Perceived ease of use	Behavioral intention to use
Mohammadi (2015)	- Educational quality, service quality, technical system quality - Content and information - Perceive ease of use and usefulness	- Satisfaction - Intention to use	Actual use
Mardiana et al. (2015)	- ISSM model - TAM & Unified theory of acceptance and use of technology (UTAUT) model (see Venkatesh et al., 2003; 2016).	Intention to use, use, satisfaction	Net benefits

Lee-Post (2009) - Research action and students survey	• System (design & delivery, use) • Student, instructor	Student outcomes (benefits, satisfaction)	Institutional outcome
Larhib et al. (2006)	ISSM variables where e-learning content and pedagogy is used a measure of information quality	ISSM variables: intention to use, use and consequent satisfaction	Faculty/Organizational benefits
Holsapple and Lee-Post (2006) - Several surveys with students	• ISSM model	ISSM model Perceived value of various aspects of the e-learning experience	ISSM model

2.1.3 TAM models

According to Sumak et al. (2011), 86% of research on e-learning acceptance is based on TAM, (based on a meta-analysis of 42 articles from major journals). Their model has the advantage of identifying antecedents to perceived usefulness and perceived ease of use but fails to identify them as independent or moderating variables. These "prior factors" are shown in their model and presented in Figure 3.
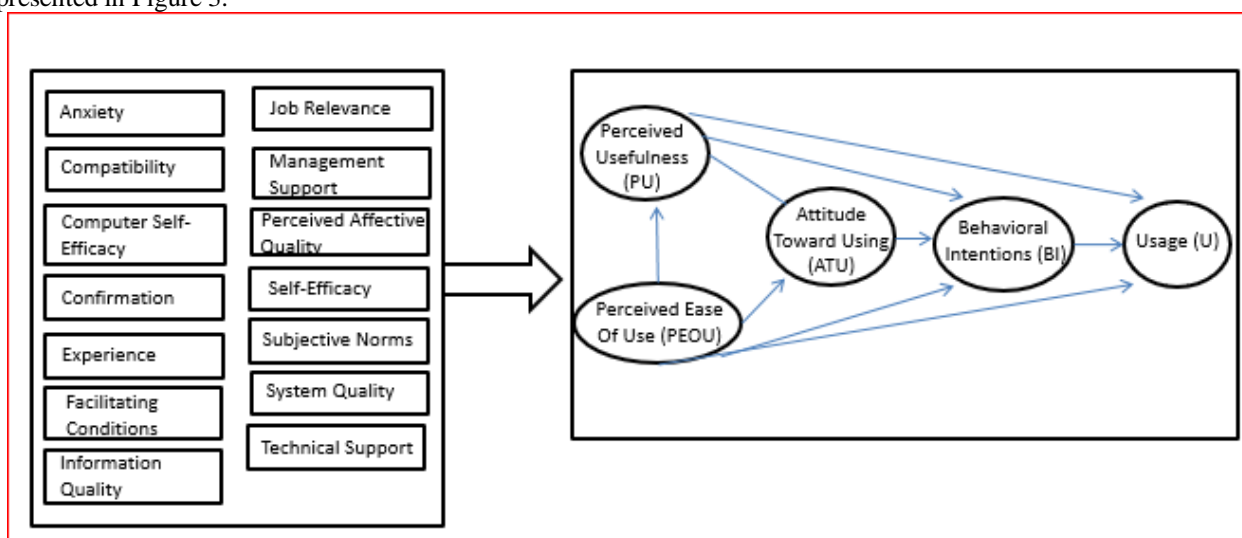

Figure 3: Sumak et al's (2011) meta-analysis of TAM use in e-learning studies

Overall, TAM-based models are widely used in Information System (IS) literature. TAM is based on Fishbein & Ajzen's (1973, 1985) model named Theory of Reasoned Action of consumer behavior (later followed by the Theory of Planned Behavior). Both recognize the evaluation of subjective and normative beliefs about an object under consideration, like an e-learning session. This evaluation results in an attitude which combines with perceived control to generate intention to use. As such, TAM highlights the importance of attitude and its effect on intention to use. Similarly, Mayer (2020) suggests that e-learning sessions are being processed at an affective level (formation of an attitude) before being processed by cognitive functions and that learning happens as the ultimate output of this chain.

Recognizing the need to introduce an affective dimension to explain intention to use, Davis et al. (1989) developed the Technology Acceptance Model, where the two main constructs, perceived usefulness and perceived ease-of-use are modelled as determinants to attitude and behavioral intention to use. This is necessary for acceptance and to ensure subsequent use (see Figure 4).
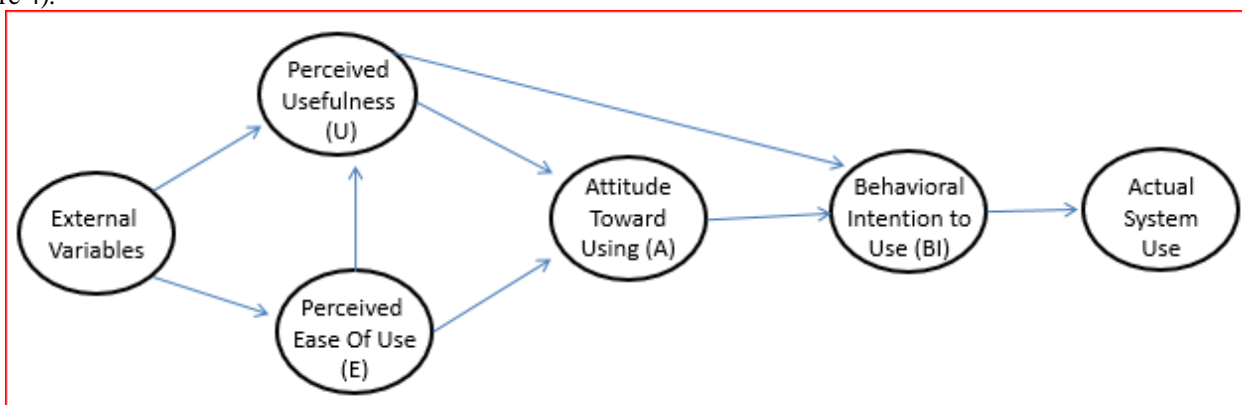

Figure 4 : Technology Acceptance Model (Davis et al., 1989).

This model was widely used but also challenged. It evolved into the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003; 2016). See Figure 5.
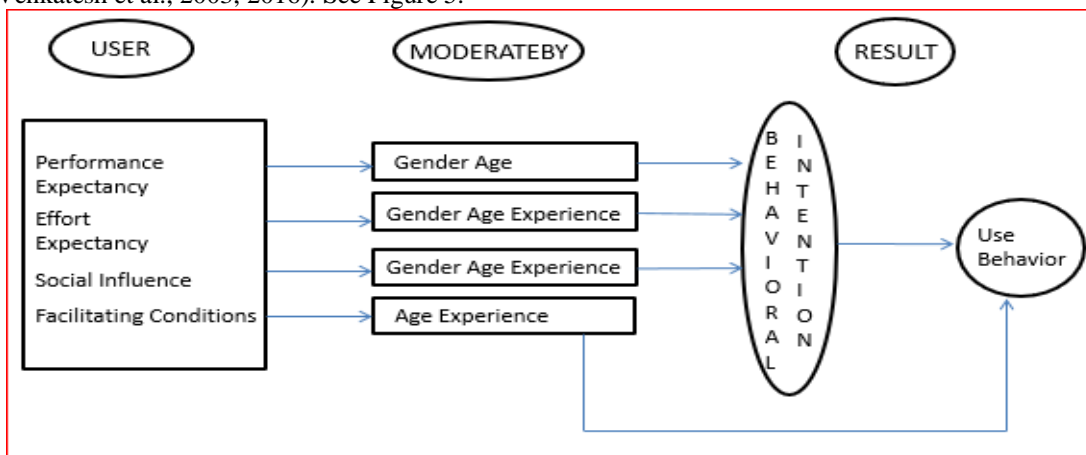

Figure 5: Unified model UTAUT by Venkatesh et al. (2003; 2016).

This model proposes that performance expectancy (former perceived usefulness) and effort expectancy (former ease of use) are not sufficient to explain usage of a system. Facilitating conditions (like systems characteristics) and social influence are also important in determining this behavior. UTAUT incorporates moderator variables, namely experience and voluntariness of use. Mayer's (2020) study suggests that emotions play an important role in e-learning effectiveness. This includes positive emotions like enjoyment but also negative emotions such as anxiety and boredom. Empirical evidence of this potential effect of emotions is given by Abdullah et al. (2016) in which they find that enjoyment is correlated with perceived usefulness and perceived ease of use but computer anxiety is negatively correlated to perceived ease of use.

Beliefs also affect IS acceptance. *Self-efficacy* is defined as an individual's belief in his/her capabilities in executing behaviors needed to bring about specific performance goals (Bandura, 1997). It impacts both perceived ease of use and usefulness (Mayer, 2020). Moreover, Punnose et al. (2012) found that among the main indicators of the intention to use e-learning were perceived usefulness, perceived ease of use and *subjective norms* (part of beliefs). See Figure 6.
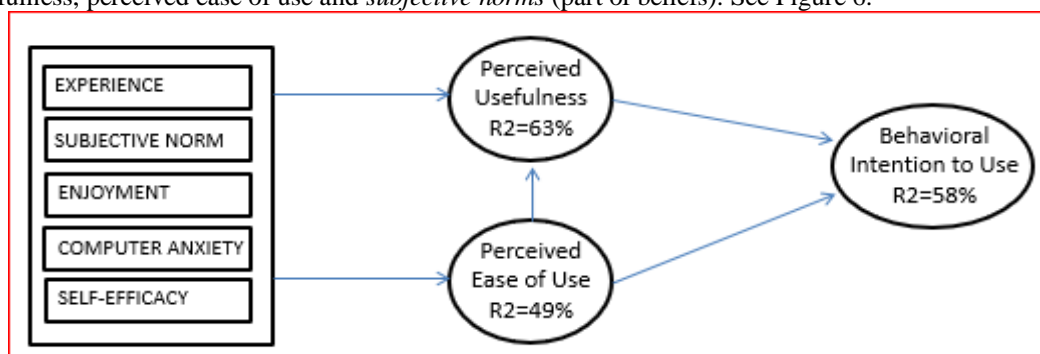

Figure 6 : Punnose et al. (2012) of behavioral intention to use

In these models, the concept of acceptance is a merger of system usage and the consequent satisfaction and/or performance expected. This may be somewhat reminiscent and vestigial of the previous century when many people experienced anxiety and fear when using technology. It was therefore believed that acceptance was important to ensure use which would lead to improvements in efficiency or effectiveness.

Both TAM and UAAUT, as well as similar intermediary models (Theory of Planned Behavior and Reasoned Action) focus on factors explicative of system usage given its potential user's characteristics and normative beliefs. As in the case of Covid-19, volitional use of IT was not always possible. Many e-learning solutions were forced upon both teachers and students. This must be considered given that it is forced behavior. A study by Belletier et al. (2018) reports that TAM and TPB both predict intention but may fail to predict actual behavior, which would be more a consequence e-learning capacities and availability. Table 2 summarizes some important variables.

Table 2: Main variables

Authors (year) /context	Independent variables	Intervening variables	Dependent(s)
Cidral et al. (2018) - Survey 301 Brazilian students	• Collaboration quality • ISSM: Service quality, information quality, system quality	• Use • User perceived satisfaction	Individual impact (effectiveness, productivity, ease to perform task, usefulness for job)

	• Instructor attitude, diversity in assessment, learner interactions		
Abdullah et al. (2016) - Survey (242 UK students)	Experience, subjective norms, enjoyment, computer anxiety, self-efficacy	Perceived usefulness Perceived ease of use	Intention to use

2.1.4 Models based on users' satisfaction as measure of success

Among the surrogate measures of IT effectiveness, user satisfaction is very often used. A meta-analysis of 37 recent studies on e-learning satisfaction reports that 13 of these supported the ISSM information system success model (Gunesekera, 2020). It identified three usability attributes of e-learning: satisfaction, learnability, and efficiency. The study concluded that, among the satisfaction theories and models of satisfaction, ISSM was well-grounded.

A study by Gonzales-Gomez et al. (2012) with 1185 students reports that satisfaction can be greater in women. This group appeared more concerned with planning and having contact with the teacher.

Another model (Sun, 2008) correlated perceived e-learner satisfaction with six categories of antecedents: learner (attitude toward computers, anxiety, self-efficacy), instructor (attitude toward e-learning and responsiveness), course (flexibility and quality), technology and internet quality, design (perceived usefulness and perceived ease of use) and environmental dimension (which strangely include diversity in assessment with interaction with others).

Wu et al.'s model (2010) presents learning satisfaction as the ultimate measure of success. It is a consequence of meeting the learner's performance expectations and of the quality of the learning climate. Wu et al.'s learning satisfaction construct borrows from Chu (2005) which includes learner characteristics and incorporates an emotions component from Sun (2008). Overall, the model considers users' characteristics, system functionality, content characteristics and the quality of interactions.
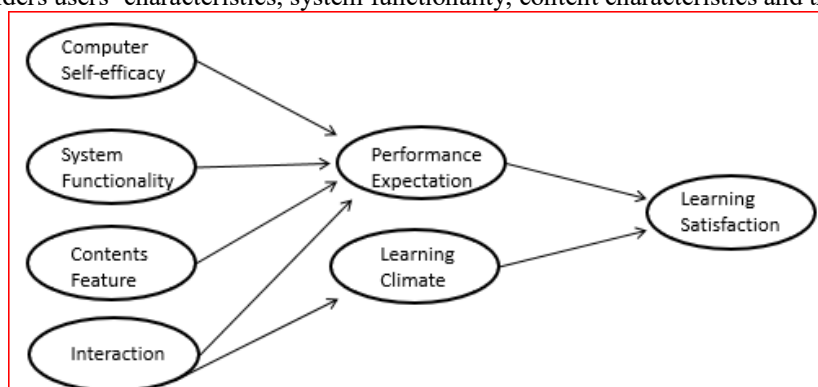

Figure 7: Wu et al. model (2010)

2.1.5 Models based on performance and other models

Two types of study are encountered: measuring effectiveness of e-learning blended learning or comparing effectiveness between e-learning, blended learning with traditional learning. Chou and Liu (2005), studied 210 students of Taiwan for 14 weeks and compared learning effectiveness (performance, self-efficacy, satisfaction and learning climate) of e-learning group with a control group. They found that the e-learning group outperformed on all four variables and concluded that learner control was the main explication for this success. If studies using satisfaction as a surrogate measure for success are numerous, conversely, there is a scarcity of studies using student performance which is yet a relatively easy to collect and directly related to the objective of teaching. Owston et al. (2013) present the results of a survey with 577 students engaged in blended learning in which they note a very strong relation between grades and their general satisfaction, the convenience, senses of engagement and views of learning outcomes. A study by Alholay et al (2018) use the ISSM main model variables, i.e. system quality, information quality and service quality that merge into an intervening variable Overall quality which affects in relation to self-efficacy both user satisfaction and actual use which impacts performance.

Such a model was proposed by Lee and Lee (2008) which introduces academic performance as the measure of e-learning success. Their model looks like an extension of ISSM but its orientation toward e-learning differentiate it enough to deserve a special consideration. The three first constructs are named in a similar manner or are inspired from ISSM but adjusted to the education process and context. Perceived usefulness and ease of use are not intervening variable but independent variables related to the system sustaining the delivery of the knowledge. They validated their model with 225 students, as Figure 8.
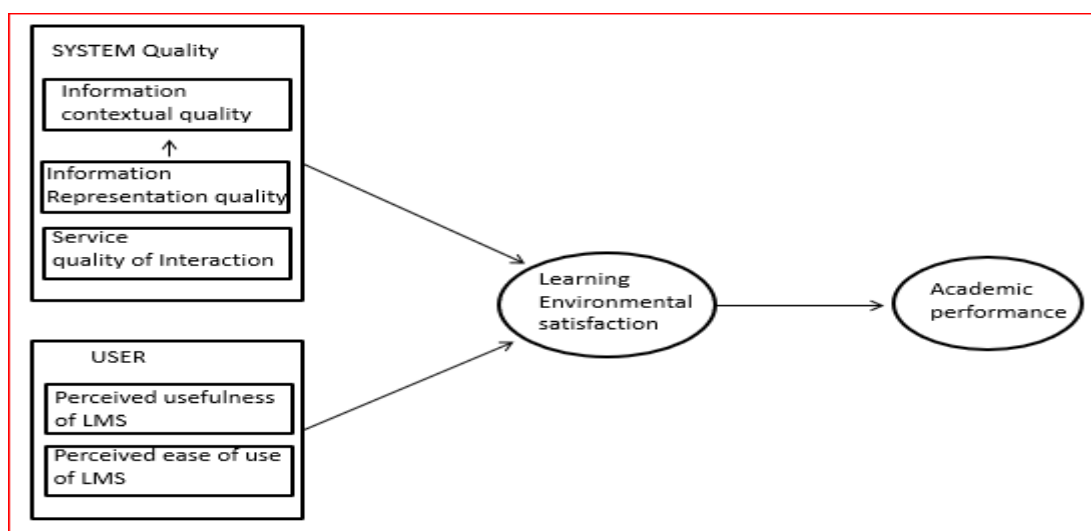
Figure 8: Academic performance as the dependent variable (Lee and Lee, 2018)

2.1.6 Holistics models and other measure of success

a) quality of e-elearning

A recent study of factors affecting e-learning quality specially in the covid-19 crises as been conducted by Elumalai et al., 2020) which concluded that all hypothesis were supported. But his questionnaire suffers from flaws. First, the questionnaire was distributed in two countries and to different level (graduate and undergraduate). Second, quality was assessed by degree of agreement with six questionable statements (page 739) :

• "E-learning raises the level of students' attainment and makes it enjoyable"; one concept per question.
• "E-learning improves the instructor's presentation of contents and activities"; this question using "improves".
• "E-learning enhances the bonding between instructors and learners".
• "E-learning is more user friendly and convenient for instructor and learner" (double construct)s.
• "E-learning enables the instructor to record the lecture and listened again by learners" (double questions one factual and the other potential)
• "E-learning provides two-way communication and cooperation among students" (two concepts)
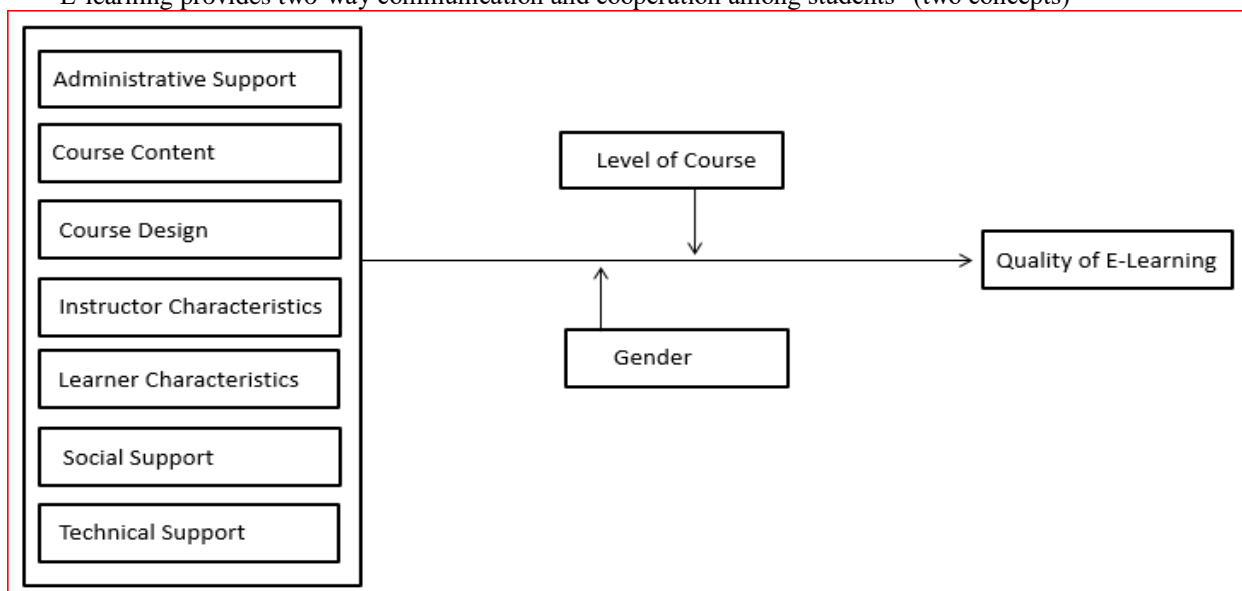
Figure 9: Elumalai model for quality of e-learning

b) effectiveness of educational process

 Lately Tatavulea et al. (2020) examined the effectiveness of online education with 362 respondents (student and teachers) from 13 European countries and found that online was less effective than face-to-face education; their study suggest that student-teacher communication, immediate feed-back, institutional support, trust in the system, effectiveness of instructional and assessment methods were critical. They found that the factors most linked to effectiveness are institutional support, effectiveness of assessment methods and trust in the system.

An important aspect of education is learner retention, according to Lee et al.(2018), who conducted a survey with 204 students. Her model verified that two rigid contents (system quality and content quality) and two flexible contents (test quality and

activity quality) determine learner satisfaction which is very strongly to learner retention. Her data did not support her hypothesis that instructor involvement would moderate the relation to satisfaction.

c) learning outcomes

An adaptation of Kirkpatrick (1959) model to Higher Education by Praslova (2010) suggests the following measures for the four stages:

i)   Reaction: Asking learners their affective reactions and the perceived value of the instruction

ii)   Learning: should be measured directly by tests, grades ,objective performance to verify if student learn anything and if there is a difference in skills and knowledge

iii)   Behaviour: Observation and surveys can be used to verify if student can actually use the knowledge and skills acquired during training, if it is remembered and apply to work

iv)   Results: more long term measure by observation or control group on the worth of the training as improvement in student life such as career progression,

d) mix model of success

ISSM model has been criticized for its focus on use as a surrogate for success. According to Freeze et al (2010) who performed a study on 674 students, system success would be more impacted by user satisfaction than by system use, which is more or less voluntary. In their model system quality and information quality have both an effect on usage and satisfaction but they did not take into account service quality in the context of e-learning.

Indeed abandon rate has been often mentioned as a weakness of e-learning (Ilham et al, 2020; Alem, 2013). An other approach to e-learning success model is given by Joo et al (2011), who propose persistence and satisfaction as dependent variables. For them, Persistence is judged as important as satisfaction, although influenced by satisfaction. Their work was based on Garrison et al (2004) study which determined that satisfaction was dependent mostly on social presence, and on teaching presence for the face-to-face teaching while, for the experienced e-learner, the cognitive presence is far most the important factor in satisfaction. A model of factors acting on continuance intention based on satisfaction is proposed by Joo et al (2018) where satisfaction is function of perceived ease of use and usefulness.

Lee et al. (2011) propose a model where success is measured by satisfaction and academic results and satisfaction are witness of success being driven by the quality of three types of support: instructional, peer and technical. If all three type of support are correlated to satisfaction and satisfaction is weakly related to academic performance, his study with 110 students did not find a direct relationship between academic performance and any of the support.

One sect peripheral of success is presented by Luo et al (2017), who questioned 643 students to assess the sense of the community which favor the stickiness of student to the e-learning environment. They report that sense of community is determined by the relations student-instructor and student-student both moderated by the student-control and access to learning content. Another approach to performance impact is given by Aldolay et al (2018) who propose a model where ISSM system quality, information quality and services quality sum up as an intervening variable, overall quality. This quality and self-efficacy determine user satisfaction and actual use which lead to performance impact.

e) Models with individual impacts

In an effort of synthesis, Cidral et al. (2018) propose the individual impact as a measure of e-learning success, subsequently to use of the system and perceived satisfaction. These two construct are correlated to the DeLone & McLean (2003) model constructs: system quality, information quality, service quality, to which he adds: collaboration quality, and the following variables from Sun (2008) model: learner computer anxiety, instructor attitude toward e–learning, diversity of assessments and perceived interaction with others.

2.2 The e-readiness constructs

Lee-Post (2009) presents a model where more stakeholders are included and the nature of benefits are split between students and institution. Using e-learning context, as suggested by the upgraded model of ISSM Larhib (2006) adapt it as shown in Figure 2 below, replacing "net benefits by "learner satisfaction" and benefits by "teachers/organizational benefits. In this adaptation of the traditional model for ISSM and the Lee's model, the main constructs are detailed below:

A)   System readiness: It refers to the adequacy of three constructs (DeLone & McLean, 2003; Rai et al., 2002):

- System quality: it refers to the use of IT for course material delivery and underlying technological capacities and constraints: Criteria for quality refer to ease of use (namely navigation and friendliness), degree of graphical realism and multimedia capacity, stability, links with other systems (ex: author systems, simulations, etc), and reporting system sophistication

- Information Quality and pedagogy quality: it refers to content (interesting and informative), interaction dynamics (group work and communication), learning resources (interactive, engaging and responsive), possibility to incorporate a large spectrum from real-word input, simulation, interactive animation and Virtual Reality, organization, adequate length, clarity, usefulness, relevance and actuality, speed of access and response time, security, availability

- Logistic quality of the service: this is the systemic proprieties resulting from the combined behavior of all technical tangible and intangible components. Delone& McLean (2003) define it as by up-to-date hardware and software", reliability, responsiveness, knowledged (assurance) and IT staff empathy toward users. It e-learning context, it comprises access to educational resources referred as anytime/anywhere learning, availability of on-line tutor or mentor, student support service providing access to resources (library, fee payment, registration, etc)

B)   Teacher e-readiness:

Teachers are main actors of learning and their role in e-learning is important to offer significant teaching experiences to the students, but despite they need to face the challenges of changing abrupt change in their work, they are not prepared Zimmerman (2020).

Distance learning has altered their roles and responsibilities from course master and givers to course developers and animators, mastering many technologies. Teaching become a more formal experience, since the presenter becomes a coach, the presence of students being less tangible, more time spent working with a discussion board and e-mailing. Emphasis is on feedback, the bulk of the work consisting in corresponding with students. The professional status, job security, workload, rewards, and intellectual freedom are being diminished as well. Among the new skills expected from teachers, Bernard et al. (2017) mention:

• Engagement strategies — to engage the learner in the content and the process of the on-line class
• Content delivery — skills for preparing and delivering content
• Remediation skills — trainer must know and respond to learners when they are confused
• Facilitation — skills to make the learning process easier for the learner
• Assessment — building assessment processes into learning without de-motivating the learner
• Accountability — strategies for providing accountability for the learner and for making learners accountable to instructor/course requirements
• Contracting for learning — articulating the roles and expectations of the on-line learning process
• Live versus on-demand — deciding when to use synchronous or asynchronous modes

A study in Saudi Arabia responded by 96 faculty based on an extensive literature review on assessment in virtual learning environments reports that neither the institutions neither the faculty were adequately prepared to conduct assessment of the online teaching as stated by Sharadgah, (2020) which also reports that Faculty complaint on the lack of training to develop e-assessments, and mechanisms to guarantee privacy and prevent cheating.

A study by Ng et al. (2020) finds that that teacher must have a leading role in building a fruit full combination of synchronous and asynchronous approaches to favor student interactions. Tartavulea et al 2020 found that teachers were not ready to face the change but their survey in Europe indicates that the transition from in person to online was relatively successful in terms of support received, oneline platforms, transformability of courses, adaptability of students. But this forced teachers to spend much more time to prepare for class. In regards of the preparation of teachers Borup & Evmenova (2019) reports that training of teachers is best achieved when teacher can apply the e-lerning style they received to the design of their own teaching.

C) Organizational Readiness:

Many Higher Education institutes were not ready to face covid and massive switch to e-learning was the only approach that seemed feasible in order to save the term and pursue their mission until the end of he pandemic (Shardgah et al, 2020). This lack of preparation meant that they launched e-learning without offering proper guidance namely about assessment modes, and consequently the treatment of cheating, the privacy and confidentiality of communications etc. This construct measures the capacity of an organization to offer e-learning services, in terms of its infrastructure capacity, its management, and financial technical and technological capacity.

It covers a wide range of factors
• Financial readiness (budget size, allocation process, monetary and workload compensation for developing courses)
• Technological skill readiness (competencies and presence of e-learning experts from pedagogy to technology)
• Equipment readiness (appropriate quantity and power, namely internet bandwidth), namely the capacity of servers to support online assessments (Sharadgah, 2020);

D) Learner readiness

Many study include a variable of Self-capacity that is part of e-readiness (Abdhulla, 2016; Punnose, 2012; Wu et al, 2010; Lee & Less, 2008; Sun et al. , 2008). Following a systematic review of literature, Alem (2013, 2014, 2016) developed an instrument which was validated and yielded with high predictive validity. In this research it has been preferred since it encompasses all dimensions of readiness and has been validated. It includes the following five aspects:

• Motivation (goals and purposes) style life and focus capacity.
• Self-directed learning capacity (study habits and learning preferences).
• Technical competence, mastering technology.
• Perceive usefulness of e-learning.
• Financial capacity to access to needed devices.

2.3 The COVID impact on the model

The main model inspired from Delone & McLean (2003) and the models using more or less the theory of planned behavior give to USE the special status of either an objective or a necessary intervening variable for user satisfaction. They take as granted that voluntariness is possible and the need to increase or improve use make senses. But the UTAUT (Venkatesh et al., 2003) mentions that voluntariness is a moderator of the intention to use. The covid-19 changes this voluntariness aspects and shortcuts the intention to use leading to use.
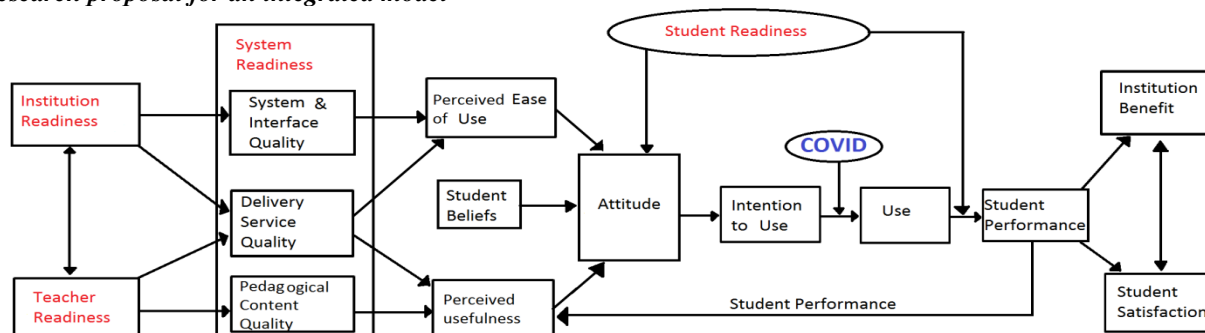
2.4 Research proposal for an integrated model

Figure 10: this research proposed model for the covid role

3. Research Design

In order to verify empirically the impact of covid on the model of success, a questionnaire was elaborated and to be distributed to an adequate sample. It is composed of the right part of the research model: from the antecedents of Attitudes to student satisfaction, as seen below:

Table 3: Source of scale for measurement

variable	Scale source
beliefs(7)	Punnose (2012), Sun et al (2008)
Perceived usefulness (6)	Punnose (2012)
Perceived ease of use (6)	Punnose (2012)
Behavioral intention if no covid	Punnose (2012)
Attitudes to ward e-learning	Venkatesh (2003)
Performance	Alem (2013; Larhib, 2006)
Satisfaction with system	Lee et al, 2008;Seta, 2018; Cidral, 2018, Owston, 2018)
Satisfaction with e-learning	Alem (2013)
Satisfaction with process	Elumalai (2020)
use	Number of hour using the system weekly
Student e-readiness	Alem (2013)

4. Conclusion

Some universities in the UK have already begun implementing different approaches. Namely, Queen's University Belfast has arranged direct charters from China to accommodate students willing to come back for their study. In Western England, 20 000 are expected (Mingjie & Yingzi, 2020). According namely to Zimmerman (2020), if student learned as much during this experimental (for all stakeholders) year of covid, then faculty role, as we know it now, may well be changed forever, and jobs may be lost. This is why an empirical investigation of the role of covid on assessment models is needed.

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