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Factors Affecting Student Performance in E-Learning: A Case Study of Higher Educational Institutions in Indonesia*

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Abstract

This study aims to determine the factors influencing student performance using the teaching and learning process through e-learning based on the unified theory of acceptance and use technology (UTAUT). This study also sets out to propose additional variables to expand the UTAUT model to be more suitable to use in higher education. This research conducted a literature review, expert interviews, and a self-administered survey involving 200 students at tertiary institutions in Riau province, Indonesia. The questionnaire data were analyzed using SmartPLS 2. This study shows that UTAUT constructs, namely, social influence, facility conditions, and effort expectancy have a significant influence on student behavior and performance, while the performance expectancy variable shows no significant effect. The additional variables, including lecturer characteristics, external motivation, and organizational structure, directly affect student performance. However, concerning student behavior, motivation and environment are the only variables with a significant effect. The results of this study suggest the behavior deteminant such as lecturer characteristics, motivation and environment, and organizational structure improve student performance. This study investigates factors affecting the performance of university students through the learning employing e-learning by developing the UTAUT constructs to include the lecturer characteristics, motivation and environment, and organizational structure in improving student performance.

Keywords: E-Learning, Teaching Online, Student Performance

JEL Classification Code: A2, I2, O3, L2

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1. Introduction

The world development has lead to the era of the industrial revolution 4.0, which emphasizes the pattern of the digital economy, artificial intelligence, big data, robotics, etc., known as the phenomenon of disruptive innovation. In this era, we encounter a different generation, called the "digital generation" or "generation Z". This generation is surrounded by screens, multitasking, prosumers, and multimedia; they also prefer video over text. In general, their daily lives have naturally integrated information technology (Jones et al., 2010; Prensky, 2001; Toffler, 1981). Therefore, the teaching system in higher education is demanded to change. The lecturer should not only be a facilitator, mediator and guide (Buckingham, 2005), but also a manager and trainer of virtual communities, a voter and prescriber of resources and information

(Man et al., 2018 ; Amato & Keith, 1991), that includes new competencies (Almenara, 2015; Giri et al., 2021).

Contemporary learning theories focus on learning as an active process of constructing knowledge, which conceives learning as personal understanding and meaning-making (Herrington, 2000). Students should engage in complex tasks involving cognitive ability, such as the activities of problem-solving, critical thinking, collaboration, and self-regulation. Lim et al. (2011) stated that the pedagogical perspective of information and communication technology is a feasible approach to develop students' creative abilities. It is important for students not to transmit facts and knowledge, but to formulate and acquire significant skills and abilities to research, choose sources of information, and build their knowledge, so that they can always provide the most up-to-date answers to the labor market (Tjahjadi et al., 2019; Shah, 2017; Julia & Onde, 2012). In this context, access to university teaching must be flexible catering to various life situations. The purposes of the practices were mainly to enhance the effectiveness of learning support and administration, followed by facilitating students' learning progress (Mujtahid et al., 2021).

Several studies reported different factors in improving student performance, such as class size (Kokkelenberg et al., 2008), multitasking (Lepp et al., 2014), and teacher quality (Azer, 2005). Furthermore, Islam and Azad (2015) as well as Ukut and Krairit's (2019) assessment is based on how perceptions of students and instructors influenced student performance ,while Merino and López (2014) and Ukut and Krairit (2019) included motivation, environment and student background as the affecting factors. Research conducted in developing countries includes Ukut and Krairit (2019) and Giri et al. (2021) concerning the inhibiting factors in information and communication technology in the teaching and learning process in higher education, namely instructor's attitude, usage behavior, environment and motivation. Furthermore, Kwame et al. (2013) suggested the use of information and communication technology in teaching all subjects in tertiary institutions as a solution for poor performance. Whereas Abaidoo and Arkorful (2014) and Kwabena et al. (2021) stated that user behavior affects performance because students spend more time on social media leading to their low academic performance.

This research is a development of the study conducted by Merino and López (2014) as well as Ukut and Krairit (2019). It adds organizational structure variables and lecturer characteristics and investigates their impact on student behavior and performance. The research was conducted at universities in Indonesia, a developing country, and therefore there are limitations in the information and communication technology system when compared to developed countries. This study aims to address this research question: Do the characteristics of lecturers, motivation and environment, performance expectancy, effort expectancy, social influence, facility conditions, and organizational structure affect student behavior and performance using e-learning technology in teaching and learning processes? For this purpose, Section 2 reviews the literature concerning the theoretical framework and the development of the unified theory of acceptance and use of technology (UTAUT) as well as research contributions. Next, Section 3 explains the research methodology used in addressing the research question. Section 4 presents the results of a statistical test of research data that has been done. Finally, Section 5 provides a review and discussion of the results of a statistical test of research data that has been presented in the previous section.

2. Literature Review and Hypotheses

A literature review was conducted to explore the variables and framework of this study. This review is the basis for the formulation of hypotheses and serves as the background for this research. Sub-topics are discussed as follows.

2.1. E-Learning Technology

This study is based on the definition of e-learning technology proposed by Heemstra and Kusters (2004) in which e-learning refers to a set of dynamic technologies that involve several technological components and devices that aid information and communication. Among such devices are broadcasting media, telecommunication technologies such as telephone, cellular networks, cable, satellite, TV and radio, computer-mediated conferencing and video conferencing. It also includes other digital technologies such as computers, the Internet, World Wide Web, Intranets and Wi-Fi networks, extranets and software applications (Ukut & Krairit, 2019).

2.2. Unified Theory of Acceptance and Use of Technology (UTAUT)

A unified theory of acceptance and use of technology (UTAUT) was articulated by Venkatesh et al. (2003). UTAUT has four main constructs that directly influence user acceptance and behavior, namely, performance expectancy, effort expectancy, social influence, and facility conditions.

Performance expectancy is the expectancy of individual technology users who believe that the use of technology will increase the productivity and performance of their work. In other words, it is the expected benefits of using technology.

Effort expectancy explains the possibility of using certain technology without much effort. This illustrates the level of simplicity and ease of use of a particular technology.

Social influence is related to the users' perception reference of the reaction of others to themselves and

social groups if certain technology users are used. This is a consideration of technology users who can convince other people in his/her group whether or not users should use the technology.

Facility conditions explain that users believe concerning the need for facilities to use new technology in an organization. This relates to the availability of organizational and technical infrastructure needed for the use of technology.

Behavior intention is defined as the likelihood of someone's plan to use technology. It also shows a direct effect on the actual use of behavior.

User behavior is using behavior in information and communication technology related to how and when people use technology, indicated by the frequency and the objective of use.

The review of previous research shows that student performance, structural characteristics, motivation and environment, and organizational structure are used to expand UTAUT because the features of these variables are identified as factors that can affect student performance (Merino & López, 2014; Ukut & Krairit, 2019; Alsharari et al., 2015; Lwoga, 2014; Sipila, 2011; Moradi & Sabeti, 2014). These additional construction definitions are used to expand the theory of acceptance and use of technology. Although several other factors were identified as factors that could affect student performance, the researchers chose these three constructs as they could be statistically measured to explain technology acceptance in the academic environment.

2.3. Lecturer Characteristics

In assessing the impact of teacher quality on student performance using information and communication technology (ICT), Lwoga (2014) identified that instructor quality is positively related to perceived usefulness and user satisfaction. Sipila (2011) and Nair et al. (2015) identified teacher methods using ICT as an important factor in determining student performance. Furthermore, Moradi and Sabeti (2014) suggested that personality traits and psychological characteristics of instructors such as, self-efficacy, understanding, attitudes and beliefs as vital instructor characteristics influencing student performance. This research was conducted in Indonesia, hence the indicator of lecturer characteristics refers to Undang-undang No. 14 tahun 2005 concerning teachers and lecturers.

According Undang-undang No. 14 tahun 2005, the characteristics of lecturers are: (1) conducting education, research and community service, (2) planning, implementing the learning process, and assessing and evaluating learning outcomes, (3) improving and developing academic qualifications and competence sustainably following the development of science, technology and art, (4) acting objectively and treating students fairly in learning without considering the gender, religion, ethnicity, race, certain physical conditions, or socioeconomic background, (5) upholding the legislation, law and code of ethics, as well as religious and ethical values, and (6) maintaining and fostering national unity.

2.4. Motivation and Environment

Based on the literature, the researchers selected the following indicators related to motivation and environment, namely, parental involvement, student motivation, learning strategies, and students' socioeconomic status. These indicators were chosen based on the existing literature with the following assumptions and interpretations.

Parental involvement: Open-minded and educated parents will provide all the equipment needed for learning through information and communication technology. This will have a positive effect on student performance (Lam & Ducreux, 2013).

Student motivation: It shows that intrinsic and extrinsic motivation of students can improve student performance (Kaplan & Maehr, 1999).

Learning strategies: This shows the ability of students to set goals, map strategies to achieve their objectives, and learn as well as their willingness and attitude towards studying (Kaplan & Maehr, 1999; Wong & Nunan, 2011).

Student's socioeconomic status (SES): Healthy self-esteem helps improve performance. Students who have independent teaching and learning facilities and the ability to pay tuition on time tend to have better performance (Suleman et al., 2012; Ahmar & Anwar, 2013).

2.5. Organizational Structure

Organization is defined as the way of unit decision-making arranged in a higher education institution, and the decision-making process related to the strengths and skills that are distributed and the types of information and communication structures in organizational units (Youssef & Dahmani, 2008; Herli et al., 2020). Hence, there is a change in the distribution of power, skills, and information in a higher education institution, from being central to transferred to the information and technology unit (Youssef & Dahmani, 2008).

The organizational structure is a way to share tasks, which are then formally grouped and coordinated. Robbins et al. (2008) suggested five elements to consider in the organizational structure, namely:

1. Specialization or division of labor, so that tasks can be coordinated.
2. The chain of command, the orders and authority flow related to the responsibilities of the levels in an organization.

3. The range of control, determining the number of levels and managers in an organization.
4. Centralized and decentralized, the way of decision-making based on managerial authority.
5. Formalization, a level of work in an organization that is standardized according to the rules.

2.6. Hypotheses

Based on the existing literature, including the findings of Erden (2013), Sung and Hwang (2013), and Goyal (2011), the selected constructs on students' performance to extend the UTAUT include: (1) values, (2) cumulative grade point average (CGPA), (3) self-efficacy, (4) the ability to use ICT, and (5) student achievement.

Based on a literature review and contribution, the research framework is designed and formulate the following research hypotheses:

H1a: *Lecturer characteristics have a significant effect on student performance.*

H1b: *Lecturer characteristics significantly influence behavior intention.*

H2a: *Motivation and environment have a significant effect on student performance.*

H2b: *Motivation and environment have a significant effect on behavior intention.*

H3a: *Organizational structure has a significant effect on student performance.*

H3b: *Organizational structure has a significant effect on behavior intention.*

H4: *Performance expectancy has a significant effect on behavior intention.*

H5: *Effort expectancy has a significant effect on behavior intention.*

H6: *Social influence has a significant effect on behavior intention.*

H7: *Condition of the facility has a significant effect on user behavior.*

H8: *Behavior intention has a significant effect on user behavior.*

H9: *User behavior has a significant effect on student performance.*

3. Research Methodology

3.1. Context of Study

Indonesia is an appropriate context to test the research hypotheses, as it is a developing country with several universities that have used e-learning technology in the teaching and learning process. Hence, its impact on student performance can be examined. This study investigates the factors determining student success in the teaching-learning process by examining the influence of lecturer characteristics, motivation and environment as well as organizational structure on student behavior and performance. In addition, this study explores the impacts of performance expectancy, effort expectancy, social influences and facility conditions on behavioral intention. Next, we also examine the effect of behavior intention on user behavior as well as user behavior on student performance.

3.2. Sample

The study was conducted at some universities in Indosnesia, and the respondents were students majoring in accounting who had experienced a teaching and learning process through e-learning technology. Data collection was undertaken by administering 200 questionnaires directly between March 2019 and May 2020. The returned questionnaires totaled 185 (92.5%), and 176 (88%) could be further analyzed. We tested the proposed conceptual model using variance-based Structural Equation Modeling (SEM).

4. Results and Discussion

This research focuses on testing each formulated hypothesis. The tests conducted include testing the data and the hypotheses directly on each variable.

4.1. Composite Reliability and Path Analysis

Composite reliability tests the internal consistency between indicators and their construct. The results of composite reliability test are illustrated the following:

Based on Table 1, it can be seen the composite reliability value of each variable is greater than 0.6. Thus, the model in this study has met the composite reliability criteria.

The construct of behavior intention is influenced by performance expectancy, effort expectancy, lecturer characteristics, motivation and environment, social influence, and organizational structure (R^2 = 0.419). This implies that these variables explain the variance of the behavior intention by 41.9%, while the remaining 58.1% is explained by other variables that are not included in the model. Next, the construct of student performance is influenced by user behavior (R^2 = 0.324), indicating that the user behavior explains 32.4% variance of student performance. Furthermore, the construct of user behavior is affected by behavior intention and facility conditions (R^2 = 0.419), meaning that these variables account for 40.9% of the variance of the user behavior.

Chin (1998) grouped the value of R^2 into three categories, namely, substantial (0.67), moderate (0.33), and weak (0.19). Thus, it can be stated that the R^2 values of behavior intention,

student performance, and user behavior are at a moderate level. Next, hypothesis testing was performed using the output for inner weight and the results are shown in Table 2.

4.2. Discussion

This study investigates the factors determining student performance using a learning method through web 4.0 technology by developing the UTAUT model. Several studies have been done, but they showed some differences in the emphasis of variables influencing user behavior on performance. Furthermore, there has been limited study examining the effect of organizational structure on student performance. The organizational structure will have an impact on the quality of services provided to the students. The institution having a separate service unit dealing with the information technology will have far better service than those with a service unit combined with other divisions. We focus on our best knowledge, namely the influence of student behavior in the teaching and learning process using technology on the performance of university students. The research results are discussed in the following section.

Table 1: Composite Reliability Dan *R*-Square

Variable	Composite Reliability	*R*-Square
Behavior intention (BI)	0.838	0.419
Performance expectancy (PE)	0.888	
Effort expectancy (EE)	0.850	
Facility condition (FE)	0.857	
Student performance (SP)	0.871	0.324
Lecturer characteristics (LC)	0.830	
Motivation and environment (ME)	0.822	
Social influence (SI)	0.867	
Organizational structure (OS)	0.864	
User behavior (OB)	0.825	0.409

Lecturer characteristics affect student performance

In this study, we found that lecturers are human resources of higher education that are in direct contact with the students. Therefore, the characteristics of lecturers play a vital role in the teaching process, especially using web technology 4.0, where the discipline and responsibility of the lecturers in classroom management dominantly influence the student performance. The bad characteristics of lecturers will also negatively affect the teaching and learning process because the overly flexible teaching and learning lead to students using their time doing activities that are beneficial for their academic abilities. The results indicate that the lecturer characteristics significantly influence student performance ($T = 1.935$, $p < 0.005$), thus, H1a is accepted. This is in line with the research by Lwoga (2014); Sipila (2011); Azer (2005); Moradi and Sabeti, (2014); and Ukut and Krairit (2019), which reported that instructor quality, teaching methods, and lecturer characteristics, such as personality and self-efficacy, are positively related to student performance.

Lecturer characteristics influence behavior intention

In the teaching and learning process, lecturers not only explain materials, but also motivate students to improve both their academic and non-academic achievements. The characteristics of lecturers can influence student behavior,

Table 2: Test Results of Bootstrap Path Coefficient

Construct	Original Sample (O)	*T* Statistic (IO/STERRI)	Conclusion
LC → SP	0.212	1.935	Has a significant influence
LC → BI	0.006	0.057	Has an insignificant influence
ME → SP	0.220	1.898	Has a significant influence
ML → BI	0.190	1.625	Has a significant influence
OS → SP	0.200	1.716	Has a significant influence
OS → BI	0.056	0.462	Has an insignificant influence
PE → BI	0.072	0.675	Has an insignificant influence
EE → BI	0.243	2.077	Has a significant influence
SI → BI	0.357	3.563	Has a significant influence
FC → UB	0.278	2.468	Has a significant influence
BI → UB	0.457	4.968	Has a significant influence
UB → SP	0.299	2.897	Has a significant influence

especially the desire or intention to learn better to improve their performance. The characteristics of lecturers who are willing to share their performance related to the higher education *tridharma*, such as education and teaching as well as research and community service through information technology, can influence student behavior to be more motivated. Our research results show that the lecturer characteristics have a positive influence on behavior intention ($T = 0.057$, $p > 0.05$); however, it is not significant and, thus, H1b is rejected. This finding implies the characteristics affecting student behavior, especially intentions or desires, are not proven in this study. One reason is that the lecturers in the higher education have limited publications on both their academic and non-academic achievements, and this is in line with the research results of Abaidoo and Arkorful, (2014); and Ukut and Krairit (2019).

External motivation influences student performance

This study found external motivations, including parental involvement, student motivation, learning strategies and socio-economic status (SES) have an impact on student performance. The students having external motivation in the teaching and learning process using web 4.0 technology will master the materials better and can access more information. Thus, they will have better academic achievement, indicated by their GPA (above average). They also have good non-academic performance, such as in sports and arts. Our research results show that the influence of external motivation on student performance is significant ($T = 1.998$, $p < 0.05$) and therefore H2a is accepted. This is in line with the research findings of Ahmar and Anwar (2013); Merino and López (2014); and Ukut and Krairit (2019), which revealed that external motivation was positively related and affected student performance.

External motivation influences behavior intention

Students in tertiary education will undoubtedly interact with their environment in performing their activities. As the external motivation will have an impact on student behavior in the learning process, it will greatly affect the learning using web technology 4.0 where students study more independently. Our research results show that there is a significant influence of lecturer characteristics on student performance ($T = 1.925$, $p < 0.005$), indicating that H2b is accepted. This is in line with the research of Kaplan and Maehr (1999); Wong and Nunan, (2011); Ahmar and Anwar (2013); and Ukut and Krairit (2019), which stated that external motivation including the role of parents, student motivation, learning strategies and socio-economic status (SES) have an impact on student behavior in teaching and learning process.

The organizational structure influences student performance

This study found that organizational structure influences student performance. The organizational structure in this study is the unit or part of the organization of higher education that is in charge of information technology services. With the unit or section responsible for managing information technology, indeed, the services in the teaching and learning process for students who use web 4.0 technology will be better, which in turn increasing student performance. Our results show that the significant positive effect of organizational structure on student performance ($T = 1.716$, $p < 0.1$) and, thus, H3a is accepted. This finding is in line with the study of Youssef and Dahmani (2008).

The organizational structure influences the behavior of intention

We also examine the effect of organizational structure on intention behavior. However, it is not significant ($T = 0.462$, $p > 0.05$) and H3b is rejected. This is because students where the research was conducted, namely, the universities in Riau Province, are not directly related to the units or sections responsible for the information technology in the teaching and learning process. The service for academic activities is provided by the administration staff at each faculty. Consequently, the presence or absence of organizational structure does not affect student behavior in the teaching and learning process.

Performance expectancy influence behavior intention

In line with the concept of UTAUT theory, this study reexamines the influence of performance expectancy on behavior intention. However, the result is not significant ($T = 0.675$, $p > 0.005$), indicating that performance expectancy has no significant effect and, thus, H4 is rejected. This may be due to the attitude of the students where the study was conducted that shows no visible difference in behavior between those with high and performance expectancy. The students really enjoyed the teaching and learning process using web 4.0 technology because they got the freedom in the learning process and they can also obtain various information easier to support their academic and non-academic activities.

Effort expectancy affects the behavior of intention

In this study, we also examine the relationship between effort expectancy and behavioral intention. The results of our study show that effort expectancy has a significant effect on behavioral intention ($T = 2.077$, $p < 0.05$) and, thus, H5 is accepted. There is a change in the behavior of students at universities in Riau province in the activities of teaching and learning process using web 4.0 technology. They expect for the ease of effort using technology. This finding agrees with Venkatesh et al. (2003); Merino and López (2014); and Ukut and Krairit (2019), which reported that effort expectancy is positively related and has a significant effect on behavior intention.

Social influences influence behavior intention

This study also investigates the social influence affecting behavior intention. The results show that social influence has a significant effect on behavior intention ($T = 3.563$, $p < 0.05$) and, thus, H6 is accepted. This study found that student behavior is influenced by the others' reactions to themselves in the use of technology; the more positive the reaction of others, the better the impact of their behavior. This is in accordance with Lwoga (2014); Merino and López, (2014); and Ukutan and Krairit (2019) who reported that social influence is positively related and has a significant effect on students' behavioral intentions.

The facility condition influences the user behavior

In this study, we discovered that the availability of facilities in using web 4.0 technology is vital because facility conditions play a role in the teaching process. Adequate facilities will have a positive impact on student behavior in the teaching and learning process. Our results show a significant effect of facility conditions on user behavior ($T = 2.468$, $p < 0.05$) and, thus, H7 is accepted. This is in line with Venkatesh et al. (2003); Merino and López (2014); and Ukut and Krairit (2019) who revealed facility condition is positively related and significantly affects user behavior.

Behavior intention affects user behavior

This study revealed that students' behavior intention in using tertiary technology significantly influence their behavior ($T = 4.891$, $p < 0.05$). Thus, H8 is accepted. This finding is in line with research conducted by Venkatesh et al. (2003); Merino and López (2014); and Ukut and & Krairit (2019). They also reported that behavioral intention has a positive significant influence on user behavior.

User behavior influences student performance

This study also found that student behavior using web 4.0 technology in the teaching and learning process affects student performance. The results show that user behavior has a significant effect on student performance ($T = 2.897$, $p < 0.05$) and, thus, H9 is accepted. This result agrees with research results of Lwoga (2014); Sipila (2011); Azer (2005); Moradi and Sabeti (2014); and Ukut and Krairit (2019), which reported that user behavior positively influences student performance.

5. Conclusion

The teaching and learning process using web 4.0 technology in universities contribute to improving student performance. The influencing factors examined are the development of the unified theory framework of acceptance and use technology (UTAUT). This study investigates the variables that influence student behavior and performance, including lecturer characteristics, external motivation, organizational structure, performance expectancy, effort expectancy, social influence, and facility conditions. This study found that the constructs of UTAUT, namely, social influence, facility conditions and effort expectancy, have a significant influence on student behavior and performance, except the performance expectancy. The additional variables of lecturer characteristics, external motivation and organizational structure directly affect student performance. However, student behavior is only affected by external motivation, while the remaining variables (lecturers and organizational structure) show no significant effect.

This research is limited to universities in Riau province, Indonesia. Consequently, the findings may not be generalizable to other countries. This study fills the gap concerning the relationship between user behavior and student performance in the UTAUT model because the majority of the experts interviewed (95%) believed that the end result of user behavior will reflect the student performance. Furthermore, the process of teaching and learning through information system and web 4.0 technology in higher education is influenced by the intention and behavior of students in achieving academic and non-academic achievements in universities in Pekanbaru, Riau, Indonesia.

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