

Assessment of Behavioral Intention to Adopt Educational Mobile Application in Advanced Mathematics for Engineering Education

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Abstract. Technology has long played a crucial role in society, including its application in education. The learning experiences of students in higher education have been significantly transformed. This study explores the adoption and acceptance of the Advanced Math mobile application among students, focusing on four key variables: social influence, performance expectancy, effort expectancy, and facilitating conditions. The study involved 253 participants who downloaded and used the Advanced Math mobile application as a supplemental study tool. The findings indicate that social influence significantly impacts students' decisions to use the application. The performance of the mobile application enhances students' productivity by providing easy access to lecture information, thereby supporting their learning process and motivating them to use the application. Facilitating conditions enable students to work independently at their preferred pace and access the application anytime and anywhere. The behavioral intention to use the mobile application is associated with positive feelings, leading students to use it as an additional resource for learning Advanced Math. Mobile applications have the potential to revolutionize educational settings by enhancing engagement, accessibility, and personalized learning. However, their effective use in the classroom necessitates robust pedagogical frameworks that align with learning objectives and provide continuous support for educators. Future research should continue to explore the challenges and opportunities of integrating mobile applications into the classroom to support both teachers and students in an increasingly digital society.

Keywords: Higher education; Behavioral intention; Usability; Social influence; Mobile applications; UTAUT.

1.0 Introduction

It is a reality that technology has dominated society for so long. Everyone uses technology, from kids to teens, including adults and seniors. Modern life is impossible without smartphones, which simplify everything by changing how people play, socialize, communicate, shop, and even enhance students' learning styles. With the advent of information technology, higher institutions have transformed the student learning experience in many ways. One of these is integrating mobile applications (Criollo et al., 2021) to easily access course materials, which enables students to review the topics without internet connectivity anytime and anywhere (Pereira & Rodrigues, 2013). Mobile learning has become a new trend in education owing to the diverse needs of students primarily in reviewing higher mathematics topics.

Furthermore, mobile devices are currently one of the most popular ways to teach and learn mathematics. Still, educational mobile applications in engineering have not yet reached the same degree of development as e-learning

applications. The Unified Theory of Acceptance and Use of Technology (UTAUT) framework, which takes into account four important factors: performance expectancy, effort expectancy, social impact, and facilitating conditions, can be used to assess behavioral intention in technology adoption. Performance expectancy was used in the context of mobile learning to show that students can use mobile learning to learn at their own pace, comfort, and speed (Alshabeb et al., 2020). It was found that performance expectancy had a substantial impact on behavioral intention to use mobile (Wang et al., 2011), while perceptions of the benefits of improving job performance are what drive their use of mobile learning (Iqbal, 2012). The second factor is effort expectancy, which deals with the ease of use associated with the use of a system or measures how easy it is for someone to attempt the technology's adaptation (Arenas, 2015). The students' adoption of technology in the classroom is mostly driven by their perception of its ease (Chang et al., 2011). Effort expectancy emphasizes the value of user-friendly features; students are more likely to accept a technology when they believe it to be easy to use (Abu-Al-Aish et al., 2012). The third factor is social influence. Adoption and utilization of technology are greatly influenced by friends and family who are already using technological platforms and devices (Zhou et al., 2019). A student's motivation and engagement in the classroom can be significantly increased through the use of mobile learning technologies (Ciampa, 2014). The last factor is the facilitating condition, which refers to individuals' perceptions of the support available in system adoption (Venkatesh et al., 2003). The offline features increase its dependability and support for adopting the mobile application.

This study assessed the factors that influence the adoption and utilization of the Advanced Math mobile application for industrial engineering by utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT) framework.

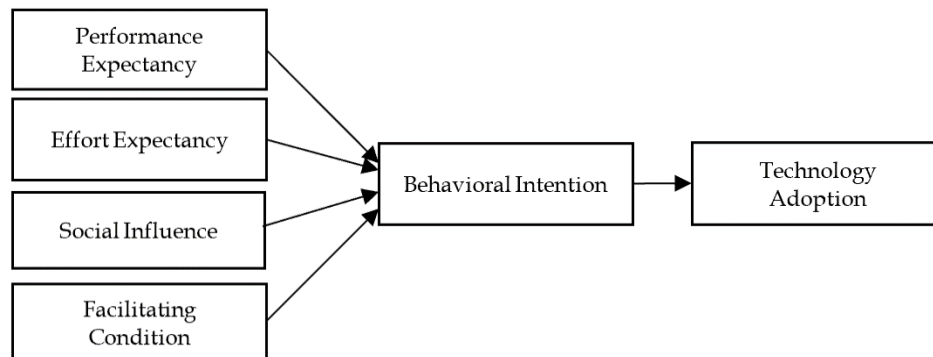


Figure 1. Unified Theory of Acceptance and Use of Technology (UTAUT)

2.0 Methodology

2.1 Research Design

This study employed the descriptive-evaluative methodology to quantify the factors influencing the adoption and utilization of mobile applications for Advanced Math. This research utilized the Unified Theory of Acceptance and Use of Technology (UTAUT) framework, which has been applied in several domains, such as e-learning systems. In this study, the level of acceptance to use the technology among respondents was evaluated based on performance expectancy, effort expectancy, social influence, and facilitating conditions.

The mobile application was installed by the users on smartphones and used as a supplemental aid in their study. The features of the application are illustrated below, as shown in Figure 2. In addition, the design of the system followed the Commission on Higher Education Memorandum Order (CHED CMO) for the syllabus, which includes an introduction, an example, and its solution with explanation.

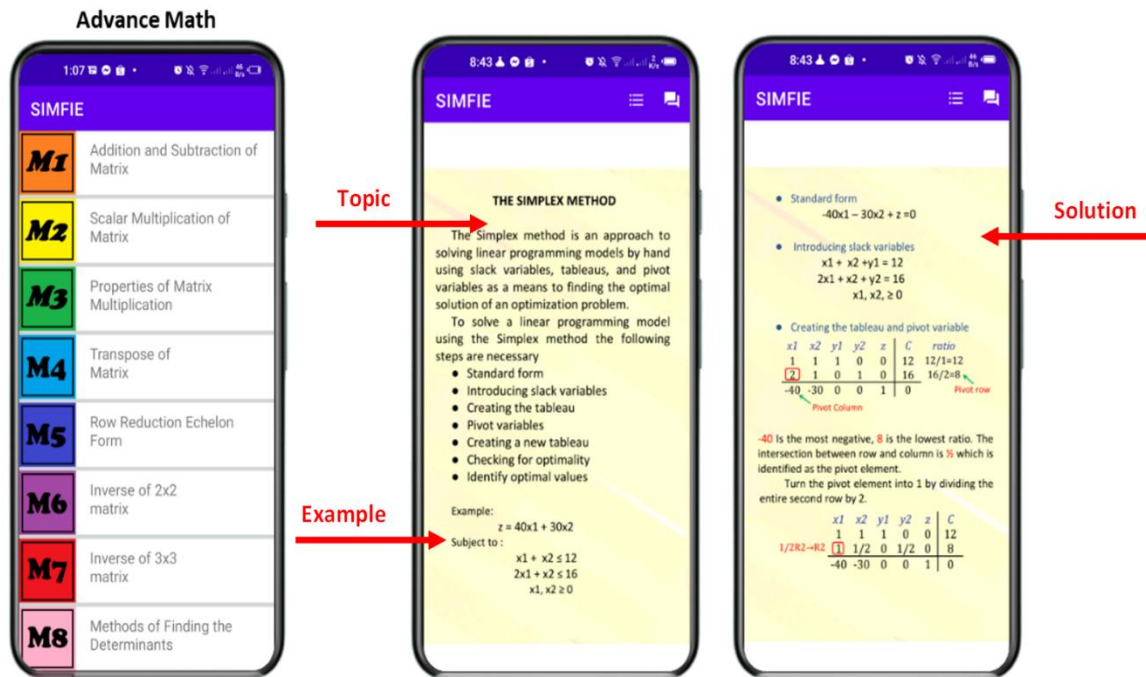


Figure 2. System Design of Advanced Math Mobile Applications

2.2 Research Participants

The study was conducted in Quezon City University, located in Barangay San Bartolome, Novaliches, Quezon City, Philippines. The study's participants consisted of 253 students enrolled in the Advanced Math subject of Industrial Engineering course for the second semester of 2021–2022 academic year.

2.3 Research Instrument

The researcher used the adopted and modified instrument of Unified Theory of Acceptance and Use of Technology (UTAUT) framework which was validated by the Industrial Engineering experts to assess the motivations influencing the level of acceptance of the users to adopt the Advanced Math mobile application in terms of performance expectancy, effort expectancy, social influence, and the facilitating conditions that align with how users perceive the application. Each variable consists of five items, which were created to describe the level of acceptance the user experienced., a 5-point Likert scale was employed. A scale of 5 was deemed highly acceptable, while 1 was considered unacceptable.

2.4 Data Gathering Procedure

For this study, data collection followed a series of steps. First, a letter requesting permission to carry out the study was sent to the Director of the Department of Research, Extension, Planning, and Links. After the approval, the researcher designed and developed the instructional mobile application for Advanced Math. Third, the professor of Advanced Math assisted with the download and installation of the mobile application. It was utilized as an offline study resource. Fourth, the researcher and the Advanced Math professor described the nature of survey questionnaires, along with its purpose. The survey questionnaires were distributed online. Following the completion of the research questionnaires, pertinent data was gathered and tallied. Lastly, the researcher assured that the respondent's information would be treated with the highest level of confidentiality.

2.5 Ethical Considerations

Confidentiality shall be maintained by treating the information that is collected with the utmost care. Informed consent was acquired. Approval from the respondents will be requested. Furthermore, autonomy was used. There is always a chance for respondents to decline to take part in the survey.

3.0 Results and Discussion

3.1 Acceptability of the Technology

In terms of Performance Expectancy

Table 1. Descriptive statistics of the level of acceptability of the technology in terms of performance expectancy

Indicators	Mean	Interpretation
1. Mobile application is effective in studying lessons	4.12	Acceptable
2. Mobile application increases my productivity at school	4.75	Highly acceptable
3. Mobile applications provide ease of getting information	4.73	Highly acceptable
4. Mobile applications provide pleasure when using it	4.60	Highly acceptable
5. Mobile application is enjoyable while studying lesson	4.55	Highly acceptable
Average Weighted Mean	4.55	Highly acceptable

In terms of performance expectancy, Table 1 shows the respondents' acceptance level of using the Advance Math mobile application. The respondents' evaluations yielded a highly acceptable interpretation for the mobile application, which increases productivity at school. Students find mobile learning advantageous, which increases their motivation to study (Alshabeb et al., 2020). Furthermore, the mobile application provides ease of getting information; this involves learning more effectively and having better access to instructional materials in a way that makes it pleasurable to use. The data implied that students' efficacy and efficiency increased by utilizing the mobile application while accomplishing tasks related to school (Iqbal, 2012). Meanwhile, mobile applications effectively facilitate learning and are effective in studying lessons by making the information easier to understand, which signifies an acceptable interpretation. The results of this study further support Iqbal's (2012) claim that respondents' perceptions of the benefits of improving job performance are what drive their use of mobile learning. To sum up, the level of acceptance of respondents adopting the Advance Math mobile app indicated a highly acceptable interpretation. This suggests that the mobile application's perceived performance to boost academic achievement is what motivates users to accept it.

In terms of Effort Expectancy

Table 2. Descriptive statistics of the level of acceptability of the technology in terms of effort expectancy

Indicators	Mean	Interpretation
1. I find mobile application easy to learn	4.53	Highly acceptable
2. Manipulating mobile application is easy	4.44	Acceptable
3. Mobile application is comfortable to use	4.70	Highly acceptable
4. I can use mobile application in my own pace	4.60	Highly acceptable
5. Mobile application is interesting to use	4.43	Acceptable
Average Weighted Mean	4.54	Highly acceptable

Based on Table 2, the study's findings showed that respondents' level of acceptance of the mobile application is highly acceptable in terms of effort expectancy. Since it is comfortable to use, they are more persuaded to utilize technology in their learning processes when they find it easy to navigate the features of the system. This result emphasized that mobile technology's simplicity of use had a beneficial impact on users' effort expectations and usage (Chang et al., 2011). In addition, the mobile application can be used at their own pace, which permits them to use the application at their most convenient time and place. This self-paced scheme boosts the learning process by letting users learn according to their individual preferences. Considering the respondents' perspective, the mobile application is easy to learn without the need for far-reaching tutorials due to its user-friendly interface. On the other side, manipulating the mobile application is easy for the respondents and considered acceptable. The simplicity of the main menu makes it easy to use its diverse features as they develop familiarity during manipulation. Likewise, the mobile application is interesting to use because most of the topics are related to the lessons. The application provides users with content that is interesting, which encourages them to keep using it. To summarize, perceived ease of use of the mobile application enhances efficacy and satisfaction in the learning experience.

In terms of Social Influence

Table 3. Descriptive statistics of the level of acceptability of the technology in terms of social influence

Indicators	Mean	Interpretation
1. People influence me to use a mobile application	4.75	Highly acceptable
2. I get engaged with school activities because of mobile application	4.70	Highly acceptable
3. It is easy for me to become skilled using a mobile application	4.45	Acceptable
4. Using mobile applications boosts my learning experience	4.45	Acceptable
5. Using mobile applications increases my self-confidence	4.65	Highly acceptable
Average Weighted Mean	4.60	Highly acceptable

In terms of social influence, Table 3 illustrates that the Advanced Math mobile application is highly acceptable for students. The data revealed that people influence their decision to use the application. Seeing family and friends use the application with positive feedback can convince them to use it based on their recommendations. Friends and family who are already utilizing technological platforms and gadgets have a significant influence on people's adoption and use of technology (Zhou et al., 2019). Students get engaged in school activities because of mobile applications. They have access to information at all times, which helps them stay on top of school-related tasks even outside of school. Moreover, students increase their self-confidence because they practice skills at their own pace and acquire fresh information. Conversely, students find it acceptable because the mobile application boosts their learning experience as they develop their abilities. The study's findings disclosed that individuals have a big impact on how mobile applications are used, frequently with favorable results. Parents, instructors, and classmates' encouragement can motivate students to explore educational applications, which can boost their confidence level.

In terms of Facilitating Conditions

Table 4. Descriptive statistics of the level of acceptability of the technology in terms of facilitating conditions

Indicators	Mean	Interpretation
1. I can rely on using mobile applications even no internet connection	4.65	Highly acceptable
2. Mobile application is compatible with smartphones	4.38	Acceptable
3. The aesthetic features of mobile applications can enhance visual usability	4.40	Acceptable
4. Mobile application is responsive to its usability	4.33	Acceptable
5. I can access mobile applications anytime, everywhere	4.70	Highly acceptable
Average Weighted Mean	4.49	Acceptable

Table 4 presents the data with regards to the level of acceptance of students adopting the Advanced Math mobile application in terms of "facilitating conditions." The data showed that the mobile application is highly acceptable because it can be accessed anytime and anywhere. The ability to utilize the offline features of the application improves dependability because users can rely on it when reading and reviewing lessons. Likewise, the students can rely on mobile applications even without an internet connection. This allows students to review the material at any time and from any location, even in the absence of internet connectivity (Pereira & Rodrigues, 2013). Meanwhile, it is acceptable for the students that the aesthetic features of mobile applications can enhance visual usability. The eye-catching visuals and color schemes can produce a relaxing atmosphere, which enhances the application's usability. In addition, the mobile application is compatible with smartphones and responsive to their usability. It can be installed and run effectively on smartphones and delivers improved features. The study's findings showed that the flexibility to use mobile applications from anywhere at any time provides a number of advantages that improve user convenience and functionality. This facilitates learning while on the go, which is the foundation for promoting engagement, productivity, and connectivity.

3.2. Behavioral Intention in Adopting the Technology

The respondent's level of behavioral intention to utilize the Advanced Math mobile application is discussed in Table 5. The students find it highly acceptable to use the mobile application as a supplemental tool for studying lessons. For the students, the mobile application is an additional study tool that speeds up their learning process, and they intend to incorporate the mobile application into their lessons.

Table 5. Descriptive statistics of the level of behavioral intention in adopting the technology

Indicators	Mean	Interpretation
1. I intend to incorporate the mobile application into my lessons	4.56	Highly acceptable
2. It is interesting to use the mobile application	4.39	Acceptable
3. It is advisable to recommend the mobile application to other students	4.50	Highly Acceptable
4. I like to use the mobile application as a supplemental tool for studying lessons	4.63	Highly Acceptable
5. I think it's a good idea to use the mobile application in the classroom	4.45	Acceptable
Average Weighted Mean	4.51	Highly Acceptable

Furthermore, they would recommend the mobile application to others. Conversely, it is acceptable to the students that it is a good idea to use the mobile application in the classroom because they think it can enhance their learning experience. It follows that students are clearly in favor of using the mobile application in the classroom, finding it an interesting tool. It was evident that there is a clear behavioral intention among the students to integrate the Advanced Math mobile application into their study routine. They view it as a useful tool that supports their learning process. The behavioral intention to use the system addresses the perceived value of using mobile learning, which stimulates joyful feelings using technology (Sagnier et al., 2020).

4.0 Conclusion

Mobile apps have become powerful instruments that have the ability to revolutionize learning environments. There is growing evidence that they can improve individualized learning, accessibility, and engagement. The benefits of integrating them into educational settings have shown potential that needs further consideration for issues like digital equity and privacy concerns. Therefore, encouraging teachers to use mobile apps effectively calls for consistent assistance and strong pedagogical frameworks that are in line with learning objectives. Strong pedagogical frameworks that support learning objectives and continual support for educators are necessary for the efficient use of mobile apps in the classroom. Future research ought to continue to examine the challenges of incorporating mobile applications in education while advancing instructional strategy in order to ensure that mobile applications continue to develop as essential elements of contemporary education and enable both educators and students to flourish in an increasingly digital world.

5.0 Contributions of Authors

Novesteras: Research, writing, methodology, conceptualization, and supervision in the design and development of mobile applications, and editing.

6.0 Funding

No funding has been provided for this study

7.0 Conflict of Interests

The author declares no conflicts of interest about this paper.

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