investigating Determinants of Faculty Members’ intentions to Use Mobile Learning for Educational Purposes

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ABSTRACT

INVESTIGATING DETERMINANTS OF FACULTY MEMBERS’ INTENTIONS TO USE MOBILE LEARNING FOR EDUCATIONAL PURPOSES

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Northern Illinois University, 2023
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Mobile learning is a rapidly growing field in education that has gained increasing worldwide attention in recent years due to the widespread availability of mobile devices and their potential to enhance learning experiences. In Saudi Arabia, higher education institutions have explored the use of mobile learning to support teaching and learning, though limited research examines factors related to the use of mobile learning by faculty members. To ensure the success of mobile learning integration in higher education environments, it is vital to examine faculty members’ behavioral intentions to use mobile learning for educational purposes.

This quantitative study investigated how the attitudinal factors of the technology acceptance model (TAM; perceived usefulness and perceived ease of use) can predict faculty members’ behavioral intention to use mobile learning for educational purposes at King Saud University, Riyadh, Saudi Arabia. This study also examined whether gender and age moderated the relationship between the TAM constructs and behavioral intention to use mobile learning by faculty members. The findings of this study show that perceived usefulness and perceived ease of use were the statistically significant positive predictors of the faculty members’ behavioral intention to mobile learning. Gender moderated the relationship between perceived ease of use and faculty members' behavioral intention to use mobile learning. However, age did not
moderate the relationship between the TAM constructs and faculty members' behavioral intention to use mobile learning. The current study's results were discussed with previous research studies. In the end, the current study discussed limitations and implications as well as provided suggestions for future studies.
INVESTIGATING DETERMINANTS OF FACULTY MEMBERS’ INTENTIONS TO USE MOBILE LEARNING FOR EDUCATIONAL PURPOSES

BY
IBRAHIM ALBAHLI

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A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL TECHNOLOGY, RESEARCH AND ASSESSMENT

Doctoral Director:
Wei-Chen Hung
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Finally, I would like to thank my family for their unwavering love and support. Their encouragement and understanding have sustained me through the ups and downs of this journey. I especially thank my wife, who inspired me to pursue my academic dreams and instilled a lifelong love of learning. Thank you all for your contributions to this work.
DEDICATION

To my parents; my beloved wife, Asma; and my lovely daughter, Shaden,

for their prayers, support, and trust
TABLE OF CONTENTS

LIST OF TABLES ................................................................................................................... vii
LIST OF FIGURES .................................................................................................................. ix
LIST OF APPENDICES ......................................................................................................... xi

Chapter

1. INTRODUCTION ..................................................................................................................1
   Problem Statement .............................................................................................................3
   Purpose of the Study .........................................................................................................4
   Theoretical Framework and Constructs .............................................................................5
   Research Questions .........................................................................................................6
   Significance of the Study ..................................................................................................7
   Assumptions .....................................................................................................................8
   Definition of Terms ..........................................................................................................9
   Limitations of the Study ...................................................................................................9
   Chapter Summary ...........................................................................................................10

2. LITERATURE REVIEW ......................................................................................................11
   What is Mobile Learning? ...............................................................................................11
   Technology Acceptance Model .......................................................................................13
       Perceived Usefulness ......................................................................................................15
       Perceived Ease of Use ..................................................................................................15
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Variables</td>
<td>16</td>
</tr>
<tr>
<td>Behavioral Intentions Toward Using Mobile Learning</td>
<td>17</td>
</tr>
<tr>
<td>Perceived Usefulness and Behavioral Intention</td>
<td>19</td>
</tr>
<tr>
<td>Perceived Ease of Use and Behavioral Intention</td>
<td>20</td>
</tr>
<tr>
<td>Age and Educators’ Intentions</td>
<td>22</td>
</tr>
<tr>
<td>Gender and Educators’ Intentions</td>
<td>23</td>
</tr>
<tr>
<td>Chapter Summary</td>
<td>26</td>
</tr>
</tbody>
</table>

3. METHODOLOGY | 28 |
| Research Design | 28 |
| Variables | 28 |
| Research Questions and Hypotheses | 29 |
| Participants and Sampling | 30 |
| Instrumentation | 31 |
| Threat of Validity | 33 |
| Ethical Principles and Human Subject Compliance | 34 |
| Procedures and Data Collection | 35 |
| Data Analysis | 36 |
| Chapter Summary | 36 |

4. RESULTS | 38 |
<p>| Data Screening | 38 |
| Demographic Information | 39 |</p>
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive Statistics</td>
<td>43</td>
</tr>
<tr>
<td>TAM Constructs</td>
<td>43</td>
</tr>
<tr>
<td>Reliability of Instrument Scores</td>
<td>45</td>
</tr>
<tr>
<td>Inferential Statistics</td>
<td>45</td>
</tr>
<tr>
<td>Research Question 1</td>
<td>45</td>
</tr>
<tr>
<td>Research Question 2</td>
<td>51</td>
</tr>
<tr>
<td>Research Question 3</td>
<td>57</td>
</tr>
<tr>
<td>Chapter Summary</td>
<td>64</td>
</tr>
<tr>
<td>5. DISCUSSION</td>
<td>66</td>
</tr>
<tr>
<td>Overview of the Study</td>
<td>66</td>
</tr>
<tr>
<td>Research Question 1</td>
<td>67</td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>68</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>69</td>
</tr>
<tr>
<td>Research Question 2</td>
<td>71</td>
</tr>
<tr>
<td>Research Question 3</td>
<td>74</td>
</tr>
<tr>
<td>Limitations of the Study</td>
<td>76</td>
</tr>
<tr>
<td>Implications</td>
<td>77</td>
</tr>
<tr>
<td>Suggestions for Future Research</td>
<td>80</td>
</tr>
<tr>
<td>Chapter Summary</td>
<td>81</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>83</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>90</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Constructs of the Survey Scale Assessing the Constructs of the TAM Model</td>
<td>32</td>
</tr>
<tr>
<td>2. Participant Gender</td>
<td>39</td>
</tr>
<tr>
<td>3. Participant Age</td>
<td>40</td>
</tr>
<tr>
<td>4. Participant College Affiliation</td>
<td>40</td>
</tr>
<tr>
<td>5. Participant Education Level</td>
<td>40</td>
</tr>
<tr>
<td>6. Participant Academic Rank</td>
<td>41</td>
</tr>
<tr>
<td>7. Participant Years of Experience</td>
<td>41</td>
</tr>
<tr>
<td>8. Participant Satisfaction with Mobile Devices Skills</td>
<td>42</td>
</tr>
<tr>
<td>9. Participant Nationality</td>
<td>42</td>
</tr>
<tr>
<td>10. Descriptive Statistics of the TAM Model</td>
<td>43</td>
</tr>
<tr>
<td>11. Cronbach’s Alpha Coefficients for TAM Constructs</td>
<td>45</td>
</tr>
<tr>
<td>12. ANOVA for Regression of Behavioral Intention on PU and PEU</td>
<td>47</td>
</tr>
<tr>
<td>13. Regression Model Summary Predicting Behavioral Intention</td>
<td>47</td>
</tr>
<tr>
<td>14. Regression Coefficients for the Regression of Behavioral Intention on PU and PEU</td>
<td>48</td>
</tr>
<tr>
<td>15. Correlations Among Predictors</td>
<td>50</td>
</tr>
<tr>
<td>16. Moderating Effect of Gender on the Relationship Between PU and Behavioral Intention</td>
<td>52</td>
</tr>
<tr>
<td>17. Moderating Effect of Gender on the Relationship Between PEU and Behavioral Intention</td>
<td>52</td>
</tr>
<tr>
<td>18. Correlations Among Predictors</td>
<td>57</td>
</tr>
<tr>
<td>Table</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>19. ANOVA for Regression of Behavioral Intention on PEU, Age, and Moderator</td>
<td>59</td>
</tr>
<tr>
<td>20. ANOVA for Regression of Behavioral Intention on PEU, Age, and Moderator</td>
<td>59</td>
</tr>
<tr>
<td>21. Regression Model Summary Predicting Behavioral Intention</td>
<td>59</td>
</tr>
<tr>
<td>22. Regression Coefficients</td>
<td>60</td>
</tr>
<tr>
<td>23. Regression Coefficients</td>
<td>60</td>
</tr>
<tr>
<td>24. Correlations Among Predictors</td>
<td>64</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Technology Acceptance Model</td>
<td>14</td>
</tr>
<tr>
<td>2.</td>
<td>Research Model</td>
<td>29</td>
</tr>
<tr>
<td>3.</td>
<td>Boxplots for TAM Constructs</td>
<td>44</td>
</tr>
<tr>
<td>4.</td>
<td>Boxplot for Transformed TAM Construct</td>
<td>44</td>
</tr>
<tr>
<td>5.</td>
<td>Scatterplot of Residual Values on Predict Values</td>
<td>49</td>
</tr>
<tr>
<td>6.</td>
<td>Histogram of Standardized Residuals</td>
<td>49</td>
</tr>
<tr>
<td>7.</td>
<td>Normal P-Plot of Regression Standardized Residuals</td>
<td>50</td>
</tr>
<tr>
<td>8.</td>
<td>Interaction Effect of Gender on the Relationship Between PEU and Behavior Intention</td>
<td>53</td>
</tr>
<tr>
<td>9.</td>
<td>Scatterplot of Residual Values on Predicted Values</td>
<td>54</td>
</tr>
<tr>
<td>10.</td>
<td>Scatterplot of Residual Values on Predicted Values</td>
<td>54</td>
</tr>
<tr>
<td>11.</td>
<td>Histogram of Standardized Residuals</td>
<td>55</td>
</tr>
<tr>
<td>12.</td>
<td>P-Plot of the Moderating Effect of Gender on the Relationship Between PU and Behavioral Intentions</td>
<td>56</td>
</tr>
<tr>
<td>13.</td>
<td>Histogram of Standardized Residuals</td>
<td>56</td>
</tr>
<tr>
<td>14.</td>
<td>P-Plot of the Moderating Effect of Gender on the Relationship Between PEU and Behavioral Intentions</td>
<td>56</td>
</tr>
<tr>
<td>15.</td>
<td>Histogram of Standardized Residuals</td>
<td>61</td>
</tr>
<tr>
<td>16.</td>
<td>P-Plot of the Moderating Effect of Age on the Relationship Between PU and Behavioral Intentions</td>
<td>62</td>
</tr>
<tr>
<td>17.</td>
<td>Histogram of Standardized Residuals</td>
<td>62</td>
</tr>
<tr>
<td>Figure</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>18. P-Plot of the Moderating Effect of Age on the Relationship Between PEU and Behavioral Intentions</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>19. Scatterplot of Residual Values on Predicted Values</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>20. Scatterplot of Residual Values on Predicted Values</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Appendix</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>A. G*POWER OUTCOME</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>B. FRED DAVIS’S PERMISSION</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>C. MODIFIED TAM INSTRUMENT</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>D. IRB APPROVAL</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>E. CONSENT FORM</td>
<td>101</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 1
INTRODUCTION

Because of changes imposed by the Covid-19 pandemic, educational institutions worldwide have had to adopt new learning formats, including the use of distance learning and mobile learning (Cross et al. 2019; Liaw & Huang, 2015). Moore et al. (2011) defined distance education as an educational form that does not require in-person interaction between instructors and learners during instruction and draws on different technologies to facilitate the communication process among instructors and learners. Various studies have explored new trends in teaching with technology to determine how these new trends can help both educators and students reach their learning goals (Almaiah et al., 2022; Baek et al., 2017; Lepp et al., 2014; Rossing et al., 2012; Voicu & Muntean, 2023).

One of the most recent teaching trends is the use of mobile learning to enhance the learning process for students (Safar, 2018; Yusri et al., 2015). In recent studies, mobile learning can be defined as “the use of portable devices with Internet connection capability in education contexts” (Kinash et al., 2012, p. 639). Instructors utilize mobile learning to help learners to use mobile devices to access learning resources anytime and anywhere (Elfeky & Masadeh, 2016) due to its beneficial features, such as connectivity, social interactivity, individuality, portability (Cavus, 2010), and flexibility (Dew, 2010).

Many studies (e.g., Al-Fahad, 2009; Alfarani, 2014; Aljuaid et al., 2014; Elfeky & Masadeh, 2016; Mac Callum et al., 2014) on mobile learning acceptance have been conducted to
measure students’ perceptions and attitudes toward using mobile devices for learning purposes. While there is an abundance of research on students’ perceptions of mobile learning, there are few empirical studies that have investigated the adoption of mobile learning by instructors (Al-Hamad et al., 2021; Almaiah et al., 2022; Mac Callum et al., 2014; Saroia & Gao, 2019). Yusri et al. (2015) recommended that it was important to explore users’ perceptions of using mobile learning before introducing a mobile learning system for students as well as instructors because their perceptions can influence their readiness for using the system. Thus, it is essential to conduct more studies to explore educators’ readiness, perceptions, and intentions toward using mobile learning for teaching purposes.

Educators today have their own concerns regarding their intentions for using mobile learning as a new tool in the educational process. For instance, some research shows that using mobile learning as a teaching tool has negative impacts on student learning outcomes (e.g., Chu, 2014; Lepp et al., 2014). Lepp et al. (2014) investigated the relationship between learners’ performance and the use of mobile learning and found that student’s anxiety in the learning process increases with the use of mobile apps. These findings are consistent with Chu’s (2014) study that reported the negative influence of mobile learning on students’ learning performance. These studies show that using these new learning strategies increased students’ cognitive load, causing anxiety. In contrast, other research found that using mobile learning helps motivate students to achieve appropriate learning outcomes (e.g., Martin & Ertzberger, 2013; Zhonggen et al., 2019). A study by Zhonggen et al. (2019) revealed a positive relationship between the use of mobile learning platforms and learning outcomes of learners. In other words, using a mobile learning platform motivated students to improve their performance during the learning process.
To make mobile learning in educational institutions more efficient and effective, users should be able to use a particular tool that would enhance their academic performance (Davis, 1986). Because mobile learning can improve the connection among users in the educational context, scholars (e.g., Domingo & Garganté, 2016; Kinash et al., 2012; Şad & Göktaş, 2014) recommend examining the factors that might influence the adoption of mobile learning among users in educational settings.

Problem Statement

Relevant research (e.g., Bin-Noor et al., 2021; Kaliisa et al., 2019) reported that higher education faculty in developed countries benefit from mobile learning because they can provide immediate feedback to students and keep them updated about course assignments and other course related information. However, despite the availability of mobile device technologies for both students and educators, mobile learning in developing countries, such as Saudi Arabia, is still in the primitive stage of implementation in higher education (Alfarani, 2014; Aljuaid et al., 2014; Almaiah et al., 2022). Although one of the fundamental bases of Saudi Arabia’s Vision 2030 development plan’s goal, specifically in the education sector, is to enhance education sustainability by developing a comprehensive framework for flexible learning, there is little existing research that examines Saudi faculty’ behavioral intentions toward using mobile learning for educational purposes. Thus, there was a need to explore which factors may affect faculty members’ intentions to use mobile learning (Mac Callum et al., 2014). The findings of this study could help Saudi universities, such as King Saud University (KSU), determine the factors that make mobile service technologies acceptable among users.
Although mobile learning refers to the use of portable technology devices by faculty members in different learning settings, it was important to examine the factors that impacted the intention of faculty members to avoid using it by applying technology adoption models (Ishtaiwa et al., 2015). Many research studies identified that it is important to investigate users’ behavioral intention because it provides essential information on how users tend to adopt new technologies in educational environments (Mac Callum et al., 2014; Teeroovengadum et al., 2017; Wong et al., 2013; Yeni & Gecu-Parmaksiz, 2016). The technology acceptance model (TAM), proposed by Davis (1989), was used to understand factors that predicted the KSU faculty members’ behavioral intention to use mobile learning.

**Purpose of the Study**

The purpose of this quantitative study was to investigate the behavioral intention of using mobile learning as an educational technology tool among faculty members at KSU in Riyadh, Saudi Arabia. The study examined faculty members’ intention of using mobile learning based on the TAM, because it yields information about the aspects that influenced faculty members’ decisions to use mobile learning for teaching purposes in their universities. Also, this study investigated the effect of age and gender as moderating variables on faculty members’ intention to use mobile learning as a tool for educational purposes.

To be more specific, this study examined how the attitudinal factors of the TAM—perceived usefulness (PU) and perceived ease of use (PEU)—would predict faculty members’ behavioral intention to use mobile learning as an educational technology tool at KSU in Saudi Arabia. Whereas mobile learning is still in its early stage and its factors are still unidentified, the
constructs of the TAM were applied to discover variables that affected faculty members’
behavioral intentions to use mobile learning.

By measuring which TAM constructs demonstrated faculty members’ behavioral
intention to use mobile learning at KSU, the study results reported faculty members’ intention
about the use of educational technology tools in general and their intention to use mobile
learning in particular. Because universities within Saudi Arabia are separated by gender, it was
important to include gender as a moderating variable to examine its effect on the behavioral
intention for both male and female faculty members toward using mobile learning. Because the
age of faculty members ranged from 22 to 70, it was essential to include age as a moderating
variable to discover determinants that influenced the faculty members’ behavioral intentions to
use mobile learning as a new trend in higher education settings.

This study investigated whether gender and age moderate the relationship between the
TAM constructs PU and PEU and behavioral intention to use mobile learning. The findings
reported the factors related to educators’ positive and negative perceptions of mobile learning
and helped better understand the barriers to implementing such classroom technology in a
developing country.

Theoretical Framework and Constructs

The TAM was utilized as the theoretical framework to guide this quantitative research
study. The TAM is a technology acceptance model that was proposed by Davis (1989) to explain
users’ behavioral intentions to use new technology (Aljuaid et al., 2014; Mac Callum et al.,
2014; Sariçoiban, 2013; Teeroovengadum et al., 2017; Wong et al., 2013; Yeni & Gecu-
Parmaksiz, 2016). The TAM consists of two constructs: perceived usefulness (PU) and perceived
ease of use (PEU). Davis (1989) defined PU as “the degree to which an individual believes that using a particular system would enhance his or her job performance” (p. 26); PEU was defined as “the degree to which an individual believes that using a particular system would be free of effort” (p. 26). Because this study was based on of investigating faculty members’ behavioral intentions to use mobile learning for educational purposes, I used the TAM theory (Aljuaid et al., 2014; Mac Callum et al., 2014; Sariçoğan, 2013; Teeroovengadum et al., 2017; Wong et al., 2013; Yeni & Gecu-Parmaksiz, 2016). This study included age and gender as moderating variables to investigate their effect on PU and PEU. Additional information about the TAM and its constructs are discussed in Chapter 2.

Research Questions

This study examined faculty members’ behavioral intention to use mobile learning for educational purposes at KSU in Saudi Arabia. The following research questions guided this quantitative study:

1. To what extent do perceived usefulness and perceived ease of use predict faculty members’ behavioral intention to use mobile learning for educational purposes?

2. To what extent does gender moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?

3. To what extent does age moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile
learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?

The following research hypotheses were developed:

H1: Perceived usefulness is positively related to faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H2: Perceived ease of use is positively related to faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H3: Gender moderates the relationship between perceived usefulness and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H4: Gender moderates the relationship between perceived ease of use and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H5: Age moderates the relationship between perceived usefulness and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H6: Age moderates the relationship between perceived ease of use and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

Significance of the Study

According to existing literature, many research studies on mobile learning acceptance have been conducted to measure students’ perceptions and attitudes toward using mobile learning through mobile devices (Alfarani, 2014; Al-Hamad et al., 2021; Aljuaid et al., 2014;
In contrast, there are limited empirical studies that investigate the adoption of mobile learning by educators (Mac Callum et al., 2014). However, the literature revealed a lack of information regarding faculty members’ intention to use mobile learning for educational purposes in a Saudi Arabian context (Aljuaid et al., 2014). This study provides Saudi educational instructions experts with potential determinants that could encourage faculty members to utilize mobile learning as an instructional technology tool. Thus, this study addressed that deficiency by examining the acceptance of mobile learning as a teaching tool among faculty members in KSU. The study’s outcome adds to the existing literature on using mobile learning from faculty members’ perspectives and help instructional technology practitioners examine additional factors affecting faculty members’ intention to use mobile learning. Finally, this study may help improve student learning outcomes, as it investigated barriers to implementing technology in the classroom.

Assumptions

In this study, I assumed that KSU provided the same technology, such as equal access to the internet and laptops, for both male and female faculty members. This assumption held true because both male and female faculty members benefitted from internet access and laptops. Subsequently, I assumed that most of the participants could access the survey link that invited them to participate in the study. In fact, all participants could access the survey. I also assumed that most of the participants could understand the survey whether in Arabic or in English and would answer the questionnaire honestly. Depending on their English language ability, some faculty members took the English version of the survey, while others took the Arabic version.
Definition of Terms

Behavioral intention: “the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior” (Warshaw & Davis, 1985, p. 214).

Mobile learning: the process of using portable technological devices—laptops, tablets, or smartphones—anytime and anywhere to help users perform their daily tasks in a short time (Al-Emran et al., 2016).

Perceived usefulness: “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1986, p. 320).

Perceived ease of use: “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1986, p. 320).

Technology acceptance model (TAM): an information systems theory that uses an instrument to explain users’ behavioral intention to use new technology (Davis et al., 1989).

Limitations of the Study

There were few limitations inherent in this quantitative study. The first limitation was that the sample was limited to the faculty members from one university in Saudi Arabia. This was a limitation because I was interested in the intentions of the faculty members from this university because I had access to the participants. Therefore, the findings of this study may not represent faculty members who work at other universities in Saudi Arabia.

A second was that most of the faculty members at KSU who took the survey spoke Arabic as their primary language. This limitation was addressed by translating the survey items
from English into Arabic. To ensure the accuracy in translation, I implemented a back-translation process.

Chapter Summary

This chapter introduced the research problem about faculty members’ behavioral intention to use mobile learning as a tool for teaching purposes at KSU in Riyadh, Saudi Arabia. This study had two purposes. First, this study aimed to examine how the attitudinal factors of the TAM—perceived usefulness and perceived ease of use—predicted faculty members’ behavioral intention to use mobile learning at KSU. The second purpose was to investigate whether gender and age moderate the relationship between the TAM constructs and behavioral intention to use mobile learning. Finally, this chapter provided the problem statement, theoretical framework and constructs, the purpose of the study, research questions, significance of the study, the study assumptions, the definition of terms, and limitations of the study.
CHAPTER 2

LITERATURE REVIEW

This study investigated faculty members’ behavioral intentions toward the use of mobile learning as a tool for educational purposes at King Saud University in Saudi Arabia. The relevant literature was retrieved from databases such as Ebscohost, ProQuest, and Google Scholar. The literature review looks at 1) the definition of mobile learning, 2) the technology acceptance model (TAM), 3) behavioral intentions toward using mobile learning, 4) perceived usefulness and behavioral intention, 5) perceived ease of use and behavioral intention, 6) age and educators’ behavioral intentions, (7) gender and educators’ behavioral intentions. and 8) a chapter summary.

What is Mobile Learning?

Many researchers and experts in the educational field have explored the impact of mobile learning as a new research trend on both students and educators to develop its infrastructure (Alzaza & Yaakub, 2011; Baek et al., 2017; Elfeky & Masadeh, 2016; Jung, 2015; Matias & Wolf, 2013). Researchers in mobile learning sought to expand its utility in higher education settings while maintaining the educational process (Al-Emran et al., 2016; Al-Fahad, 2009; Alfarani, 2014; Aljuaid et al., 2014; Alzaza & Yaakub, 2011).

The literature of mobile learning showed that researchers had different perspectives regarding the definition of mobile learning. Early definitions, for instance, focused on describing mobile learning as any learning experience that utilized mobile devices, such as handheld
devices and smartphones (Mcconatha, Praul, & Lynch, 2008). According to Mirski and Abfalter (2004), “Mobile learning is an emerging form of distance learning that offers both teachers and learners the opportunity to interact and gain access to educational material using a wireless handheld device, independent of time and space” (p.2). In contrast, Alzaza and Yaakub (2011) mentioned that the next generation of e-learning were digital natives, the individuals who use mobile technology to complete the learning tasks. More widely, mobile learning has been described as the technology that shifted learners’ perceptions toward the learning process because it provides learners with new ways to interact, behave, and communicate with each other (Wood & Homan, 2003). Al-Emran et al. (2014) defined mobile learning as “the use of mobile devices to interact, facilitate, and share knowledge among students and educators through the learning process” (p.2).

Matias and Wolf (2013) conducted a study to explore the effect of using mobile technology to engage students through online courses. The results showed that mobile learning was defined as a learning that allowed learners to use portable mobile devices in multiple learning contexts. Similarly, Al-Fahad (2009) described mobile learning as a learning trend that allows educators and students to use portable mobile devices anywhere and anytime to perform their daily tasks.

The concept of anywhere and anytime learning was one of the features that has been mentioned in other definitions of mobile learning (Al-Emran et al., 2016; El-Hussein & Cronje, 2010). This concept led Al-Emran et al. (2016) to develop a comprehensive definition of mobile learning in higher education’s context to apply the fundamental idea of mobile learning into traditional learning experiences. Al-Emran et al. stated that the main components of mobile learning included four concepts: mobility of technology, mobility of learners, mobility of
educators, and mobility of learning. Other scholars (e.g., El-Hussein & Cronje, 2010) indicated that mobility of technology included mobile software and hardware with an internet connection and wireless application protocol to deliver learning materials and information over the internet. The mobility of learners allows them to complete the learning process without constraint on learning sites through the use of available mobile devices (Al-Emran et al., 2016). Al-Emran et al. (2016) defined the mobility of educators as the process whereby educators could complete the learning tasks without constraint on learning sites and time by using portable mobile devices, such as laptops, tablets, and smartphones. This study adopted the definition of mobile learning as one that includes “the process of using portable technological devices—laptops, tablets, or smartphones—anytime and anywhere to help users perform their daily tasks in a short time (Al-Emran et al., 2016, p. 94).

A review of literature in regard to the definition of mobile learning, especially in the context higher education, revealed that it is still in a developing phase and remains ambiguous (Al-Emran et al., 2016; Al-Fahad, 2009; Alfarani, 2014; Aljuaid et al., 2014; Baek et al., 2017; Mac Callum et al., 2014). Still, when seeking to redefine the concept of mobile learning, it is essential to include new portable devices in the definition of mobile learning due to their features of storage facilities and communication.

Technology Acceptance Model

The TAM is one theory that explains individuals’ acceptance of new technology. In 1989, Fred Davis developed the TAM, the primary goal of which was to explore the effect of perceived usefulness (PU) and perceived ease of use (PEU) on users’ behavioral attitude and intention to accept and use new technology. PU is defined as a simple process of how useful the new
technology is in a person’s learning (Teeroovengadum et al., 2017), whereas PEU is defined as how easy it is to use the new technology (Yeni & Gecu-Parmaksiz, 2016).

This model has been utilized by many researchers to guide the procedures in constructing the variables of their studies (Aljuaid et al., 2014; Mac Callum et al., 2014; Sariçoban, 2013; Teeroovengadum et al., 2017; Wong et al., 2013; Yeni & Gecu-Parmaksiz, 2016). Using these constructs, Venkatesh et al. (2003) found that both PU and PEU were statistically significant predictors of and had a positive relationship with faculty’ behavioral intentions to use mobile learning tools, such as mobile devices for teaching and learning process. In 1996, Venkatesh and Davis eliminated the need for the attitude construct because they found that PU and PEU were directly and significantly related to behavioral intention. Figure 1 shows the TAM.

Figure 1. Technology acceptance model (Davis, 1989, p. 24).
Perceived Usefulness

PU as a construct refers to whether the user trusts the new technology to address his or her needs. As Davis (1989) stated it, “PU is defined here as the degree to which a person believes that using a particular system would enhance his or her job performance” (p. 320). Thus, when new technology increases its efficiency to enhance the user’s work as well as completing different tasks quickly, the user will accept using the new technology due to its usefulness value (Aljuaid et al., 2014; Mac Callum et al., 2014; Sariçoban, 2013; Wong et al., 2013; Yeni & Gecu-Parmaksiz, 2016). For instance, Aljuaid et al. (2013) noted the capacity of mobile learning to facilitate interaction as well as to evaluate students’ performance, reporting that the two previous aspects of perceived usefulness of the technology increased its acceptance among faculty members at Taif University, Saudi Arabia.

Perceived Ease of Use

Davis et al. (1989) defined PEU as “the degree to which a person believes that using a particular system would be free of effort” (p. 320). The PEU plays a significant role in how individuals accept a new form of technology. In this respect, many previous studies found a significant relationship between perceived ease of use and individuals’ intention to use new technologies. Mac Callum et al. (2014) conducted a quantitative study to explore the relationship between the perceived ease and lecturers’ behavioral intention from different universities to use mobile learning. The finding of the study revealed that PEU affected faculty members’ behavioral intention to use new technology positively, such as using mobile learning for an educational purpose. Similarly, these findings are consistent with a study by Teeroovengadum et
al. (2017) who showed that the PEU positively influenced educators’ behavioral intention to use mobile learning. On the other hand, a study by Baek et al. (2017) presented different results. Based on their findings, the researchers concluded that Korean educators, in general, showed a low level of behavioral intention to use mobile learning for educational purposes due to technical issues related to portable devices and their applications.

**External Variables**

Davis et al. (1989) mentioned that individuals’ behavioral intentions to accept the new technology might be influenced by the external variables that moderate the degree of PU and PEU for the new technology. The external variables are related to aspects such as personal characteristics, organizational characteristics, and system characteristics (Jun, 2015; Schlag & Imhof, 2017). Although external variables in Davis’ model suggests external variables serve as predictors of PU and PEU, this study instead examines external variables as moderators of the relationship between 1) PU and behavioral intention and 2) PEU and behavioral intention. Age and gender were included in this study as moderating variables. These additional variables were among the personal characteristics that have been suggested by many researchers in future research (Aljuaid et al., 2014; Cavus, 2010; Şad & Göktaş, 2014). Because age and gender are not constructs in the TAM, they have been added to extend the variables of this study and to investigate how age and gender act as moderating variables between PU, PEU, and faculty members’ behavioral intention to use mobile learning for educational purposes.

The TAM has been validated in recent studies, which showed that the TAM was one of the most widely used models that helped predict individuals’ acceptance of new technology (Jung, 2015; Mac Callum et al., 2014; Schlag & Imhof, 2017; Wong et al., 2013). For instance,
Wong et al. (2013) conducted a study to investigate student teachers’ behavioral intentions to integrate technology tools for the teaching and learning process. The results showed that TAM shows evidence of validity when used to examine how PU and PEU predict individuals’ behavioral intention to use a technology tool for educational purposes.

Thus, this model was used to explain how users react to new technological experiences in the educational field. Furthermore, this study was guided by the TAM because it helped examine the factors that influenced the process of accepting or rejecting new technology by individuals (Wong et al., 2013). Finally, this study used the constructs of PU and PEU in the TAM to investigate faculty members’ behavioral intention to use mobile learning as a tool for the learning and teaching process at KSU in Saudi Arabia, Riyadh.

**Behavioral Intentions Toward Using Mobile Learning**

Few research studies have been conducted to explore instructors’ views toward using the mobile learning approach for educational purposes as well as factors that influence their intentions to use mobile teaching in the learning environment (Mac Callum et al., 2014; Yusri et al., 2015). The most common factors that educators cited as beneficial were time and space not being limited for learners as well as the advantages of enhancing student-centered learning (Franklin, 2011). A research study conducted by Nawi et al. (2015) aimed to develop a mobile learning application for educators’ use found that mobile learning can be designed specifically to improve the teacher’s preparation activities. The results indicated a high level of satisfaction among teachers regarding the use of mobile learning activities in preparing the teaching tasks and materials. The findings also mentioned that the teachers’ intentions to use mobile teaching increased due to the perceived usefulness of this tool as well as its positive impact on the
teaching process. This perception clearly shows that the use of mobile learning is described as futuristic and advanced compared to the use of other materials.

These findings are consistent with a study done by Cavus (2010), which showed that educators, in general, had positive opinions toward using mobile learning in their classrooms. On the other hand, a research study done in Korea revealed different results. Those findings showed that instructors in Korea showed a low level of interest in using mobile learning as a new teaching tool in the learning environment (Baek et al., 2017).

With the increased use of mobile learning in education, it is crucial to investigate factors that might increase or decrease educators’ intention to use mobile teaching. According to Mac Callum et al. (2014) digital literacy, information and communication technologies (ICT) anxiety, and ICT teaching self-efficacy influence lecturers’ intentions regarding the acceptance of mobile learning. They also found that digital literacy and PU were positively related to lecturers’ behavioral intention to use mobile learning. Another research study by Yusri et al. (2015) found that when educators have an abundance of knowledge about mobile learning, it positively impacts their perceptions toward using mobile learning for teaching purposes. Alfrani’s (2014) study explored factors that affect the intentions of female faculty members to use mobile learning for teaching purposes in Saudi Arabia. The results showed a significant negative relationship between resistance to change and the intention to use mobile devices for the learning process. For instance, instructors who had more years of experience tended to resist integrating new technology tools more than inexperienced instructors. Aljuaid et al. (2014) conducted a research study to identify factors that affect the intentions of lecturers at Taif University, Saudi Arabia, to use mobile learning for teaching purposes. The results showed that PEU and PU are related to lecturers’ readiness to use mobile learning in higher education.
Perceived Usefulness and Behavioral Intention

PU refers to “the prospective user’s subjective probability that using a specific application system will increase his or her job performance within an organizational context” (Davis et al., 1989, p. 985). Studies conducted by Aljuaid et al. (2014), Mac Callum et al. (2014), Sariçoban (2013), Wong et al. (2013), and Yeni and Gecu-Parmaksiz (2016) concluded that PU was the strongest predictor of individuals’ behavioral intention to use new technology. These studies also suggested that PU has a positive relationship with behavioral intention. For instance, Aljuaid et al. (2014) measured lecturers’ behavioral intention to use mobile learning in Saudi Arabia using the TAM. They stated that their research gap was that little was known about faculty members’ behavioral intention to mobile learning. Therefore, their study aimed at investigating the TAM constructs with additional factors, such as demographic variables, to test faculty members’ behavioral intention to use mobile learning. The study’s results showed that perceived usefulness was a significant predictor of lecturers’ behavioral intention to use mobile learning for an educational purpose. It was recommended by Aljuaid et al. (2014) that future researchers replicate the study in different universities in Saudi Arabia to be more inclusive in nature and discover all faculty members’ intention, because their study was only targeting Saudi lecturers in Taif University. Moreover, Wong et al. (2013) established a study to investigate preservice teachers’ behavioral intention to use computers as an educational technology tool in their teaching and learning. The researchers used the TAM as a theoretical framework for the study. They sent a self-report questionnaire to 302 preservice teachers who study in the education university in Malaysia. Their results showed that PU had a significant influence on preservice teachers’ behavioral intention to use computers for an educational purpose. The
results indicated that there was a positive relationship between PEU and teachers’ behavioral intentions to use computers in the learning process.

Yeni and Gecu-Parmaksiz (2016) found that perceived usefulness of ICT tools had a statistically significant relationship with special education teachers’ behavioral intention to use ICT tools. This relationship between PU and behavioral intention was both positive and strong. These findings were supported by Mac Callum et al. (2014) who reported a strong relationship between PU and attitudes to adopt mobile learning in the learning process, which was directly related to lecturers’ intention to use mobile learning due to the perceived value of the new technology.

Based on the above discussion, it was important to include PU as a predictor in the current study. Furthermore, Aljuaid et al. (2014) emphasized the usefulness of mobile learning for faculty members in higher education settings, as it could enhance their intention to use mobile learning for the teaching and learning process.

**Perceived Ease of Use and Behavioral Intention**

PEU refers to “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p. 320). The main goal of this construct is to examine how easy a specific system is for users to operate. Numerous studies (e.g., Jung, 2015; MacCallum et al., 2014; Schlag & Imhof, 2017; Teeroovengadum et al., 2017) found a positive relationship between PEU and behavioral intention. For instance, Teeroovengadum et al. (2017) collected data concerning the use of ICT tools among educators in Mauritius. Their research looked at PU and PEU and moderating variables such as gender, age, and level of qualification to examine how these variables might affect the acceptance and the use of new technology in the teaching
and learning process. For the data collection procedures, the researchers developed a survey that included a demographic information section, a TAM constructs section, and a section of teachers’ ICT literacy. The questionnaire included items about PU and PEU to investigate the behavioral intention of 365 educators from 15 colleges in Mauritius toward using new technology for educational purposes. The authors used hierarchical regression analysis as a statistical test to answer their research questions as well as to test the relationship between the determinants. The findings showed that all TAM constructs significantly predicted educators’ behavioral intention to use ICT tools for teaching and learning processes. The authors mentioned that PEU was an important predictor of teachers’ behavioral intention; that is, because ICT tools are easy to use, educators are more likely to intend to use them for educational purposes.

In a similar vein, a quantitative study was designed by Mac Callum et al. (2014) to determine lecturers’ intention to use and acceptance of using mobile learning. The study aimed to discover the impact of digital literacy, ICT anxiety, and ICT teaching self-efficacy on the PU, PEU, and behavioral intention to use mobile learning by lecturers. The study sample consisted of 175 lecturers of different ethnicities, such as European, Polynesian, Asian, and African. Structural equation modeling was used by researchers for the data collection procedure to investigate the relationship between PU and PEU on the one hand and lecturers’ behavioral intention to use mobile learning on the other. Their results showed that all factors significantly predicted lecturers’ behavioral intention to mobile learning. The most significant predictor of behavioral intention was PEU. Thus, there is a positive relationship between instructors’ behavioral intention toward using mobile learning and the PEU reported by the participants.

A few studies (e.g., Sariçoban, 2013; Yeni & Gecu-Parmaksiz, 2016) found that PEU was irrelevant as a predictor of individuals’ behavioral intention to use new technology. A study by
Sariçoğan (2013) revealed PEU did not have statistical significance regarding preservice ELT teachers’ behavioral intention to use computers for an educational purpose. These findings were supported by Yeni and Gecu-Parmaksiz (2016) who surveyed special education teachers in Turkey. The purpose of their study was to examine their behavioral intention to use mobile devices for teaching and learning processes through using the constructs of the TAM as the predictors. The results showed that PEU was not a statistically significant predictor of the behavioral intention to use a computer among special education teachers. Therefore, it was important to include PEU as a predictor to investigate its relationship with the behavioral intention to use mobile learning in the current study. Following Sariçoğan’s (2013) suggestion that future research must examine the effectiveness of PEU on educators’ behavioral intentions to use new technology, this current study utilized PEU as a predictor of behavioral intention.

Age and Educators’ Intentions

Many researchers (e.g., Alfrani, 2014; Nawi et al., 2015; Şad & Göktaş, 2014; Yusri et al., 2015) investigated the effect of age as a factor on instructors’ intention to use mobile learning as a teaching tool. These studies presented varied results. Alfrani (2014) conducted a study to explore the level of resistance to change among Saudi female faculty members. The results showed a significant relationship between resistance to change and the intention to use mobile devices for the learning process. Specifically, younger instructors showed less resistance to using mobile devices as learning tools than older teachers. Similarly, Yusri et al. (2015) conducted a study to investigate teachers’ perceptions of using mobile learning. Their findings indicated that teachers with an age range of 51 to 60 do not tend to use mobile learning technology for educational purposes. This study also found that the level of knowledge about mobile learning
plays a major role in teachers’ intention to use mobile learning. For instance, younger teachers with an age range of 21 to 30 years old showed positive intention to use mobile learning due to their high level of knowledge regarding this new teaching method.

According to the literature, four reasons explained why older instructors were reluctant to use mobile devices for educational purposes. First, older teachers avoided using applications of mobile learning due to the small font size in these applications (Nawi et al., 2015). Second, older instructors with an age range of 51 to 60 years old had a low level of acknowledging the value and usefulness of mobile learning (Yusri et al., 2015). Third, there was a lack of training programs to prepare educators to integrate mobile devices as learning tools for the teaching process. Finally, Şad and Göktaş (2014) found that using mobile phones as portable learning tools causes different issues regarding classroom management and disciplinary problems in the classroom. In contrast, owning mobile devices and financial issues were not classified as obstacles to integrating mobile learning in the education process (Yusri et al., 2015). Thus, among other reasons, age can be considered as a need for further investigation, and thus, the current study included age as a moderating variable to investigate its relationship with PEU, PU and faculty members’ behavioral intention to use mobile learning.

**Gender and Educators’ Intentions**

Instructors’ gender has been investigated in previous research studies to explore its ability to predict instructors’ intentions to use a mobile learning approach (Alfrani, 2014; Aljuaid et al., 2014; Baek et al., 2017; Cavus, 2010; Hu, 2019; Hu et al., 2020; Şad & Göktaş, 2014; Shao, 2018). Cavus (2010) conducted a study to examine the relationship between teachers’ gender and their intentions to use mobile learning. The findings showed that female teachers appeared to
have more negative attitudes toward using mobile learning tools than male teachers due to the low level of knowledge about mobile learning. However, this finding was contradicted by Baek et al. (2017) when they concluded that male teachers’ attitudes were lower than female teachers toward using mobile teaching. For instance, female teachers had positive attitudes regarding the following dimensions: “forms of mobile learning application and tools’ sufficient adequacy of communication,” “aim-mobile technologies fit,” and “appropriateness of mobile devices to teaching” (Baek et al., 2017, p. 185).

Meanwhile, gender remains a topic of some debate as some research studies assess its significance for the implementation of mobile learning (Alfrani, 2014; Hu et al., 2020; Nikolopoulou et al., 2021; Pullen, 2015; Teo & Milutinovic, 2015). For instance, Alfrani (2014) conducted a study to examine perceptions of female faculty members at King Abdulaziz University in Saudi Arabia toward using mobile learning as teaching tools and how resistance to change and social culture influence faculty members’ intentions. The results showed that the perceived social culture among female Saudi teachers in higher education influenced their intentions to use mobile devices more than resistance to change with regards to the expected performance and effort of using mobile learning for an educational purpose. Their findings concluded that resistance to change by female teachers negatively influences the acceptance of mobile teaching and learning.

On the other hand, a study established by Şad and Göktaş (2014) presented different results. Their findings showed that female preservice teachers tended to use mobile devices for an educational purpose more than males because females were more informed than males regarding the technical capabilities of mobile phones. In contrast, Aljuaid et al. (2014) found that gender, as a moderating variable, did not have a relationship with faculty members’ behavioral
intention to use mobile learning among Saudi faculty members at Taif University. To further investigate its significance, gender was included in this current study to examine the relationship between PEU and PU and the behavioral intention to use mobile learning.

A purpose of the current work was to examine gender and age as potential moderators of the relationship of both PU and PEU with faculty members’ behavioral intentions to use mobile learning. This extension of the TAM attempts to explain its ability to predict and demonstrate technology acceptance and use.

This literature review of previous studies conducted in Saudi Arabia revealed that most of the studies investigated the perceptions, attitudes, and readiness of Saudi educators as well as students to use of mobile learning (Alfarani, 2014; Aljuaid et al., 2014; Al-Fahad, 2009; Elfeky & Masadeh, 2016). Therefore, it was essential to conduct a research study to investigate the factors that influence university faculty members’ intentions to use mobile learning in Saudi Arabia. This current study investigated the faculty members’ behavioral intentions to use mobile learning utilizing the TAM as a theoretical framework to determine the factors influencing the use of mobile learning among faculty members at KSU. In addition to the main constructs of TAM, this study utilized gender and age to investigate their effects on the relationships between both PU and PEU and faculty members’ behavioral intentions to use mobile learning. This study provided answers to the following research questions:

1. To what extent do perceived usefulness and perceived ease of use predict faculty members’ behavioral intention to use mobile learning for educational purposes?

2. To what extent does gender moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile
learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?

3. To what extent does age moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?

Chapter Summary

The synthesis of literature regarding instructors’ intentions toward using mobile learning is growing every day. This trend of research is due to many schools and universities encouraging instructors to use mobile teaching as a new approach to facilitate the learning process. The research literature yielded varying results relating to instructors’ beliefs about using mobile learning as a teaching tool, reporting either negative or positive impacts on student learning outcomes. Several studies reported that when teachers utilized mobile learning for educational purposes, it helped them motivate students to achieve appropriate learning outcomes. This debate draws attention to the need for conducting more research in this area, particularly by exploring what factors might impact instructors’ intentions toward the use of mobile learning.

A number of studies, which included gender and age as variables, helped reveal which of those variables impacted instructors’ intention to use mobile learning for teaching purposes. The findings of previous studies also were consulted to highlight the issues that are related to the topic of this current study and how they were researched. For instance, older instructors were less motivated to integrate mobile learning than younger instructors (Nawi et al., 2015). Second, male instructors tend to have more positive attitudes toward using mobile learning than females
(Yusri et al., 2015). For this reason, instructors should consider age and gender as factors that as they may affect instructors’ intentions. In addition, previous knowledge and experiences regarding mobile learning were important factors that influenced instructors’ intentions and their perceptions (Cavus, 2010). As a result, training programs must be created to prepare instructors to use mobile learning as a new tool (Şad & Göktaş 2014). For instance, professionals in the field of education must create training programs to meet the needs of teachers, including different genders and ages.

Research studies also showed that faculty members’ intentions to use mobile learning required studies in different learning settings to discover other variables that might affect their intentions. Based on this review, the employment of TAM as a theoretical framework helped design the research questions for this study. Consequently, this research gap helped develop the six questions that were designed to guide the research steps for researching the topic of KSU faculty members’ intentions to use and benefit from mobile learning.
CHAPTER 3
METHODOLOGY

Research Design

This quantitative correlational study had two purposes. First, this study examined the TAM constructs of PU and PEU to predict faculty members’ behavioral intention to use mobile learning at KSU in Saudi Arabia. Second, this study investigated whether gender and age would moderate the relationship between the TAM constructs of PU and PEU and behavioral intention to use mobile devices for learning purposes. According to Creswell (2015), researchers can assess the relationship among variables by using a correlational design, because it will help to relate outcomes through one or more measured predictors.

Variables

This study included PU and PEU as predictor variables. The outcome variable was faculty members’ behavioral intention towards the use of mobile learning. In addition, investigating whether age and gender moderate the predictive relationships PU, PEU, and behavioral intention was essential. Examining mobile learning through these lenses (i.e., the TAM constructs, gender, and age) provided information that is necessary to assess the intention of using mobile learning as a tool for educational purposes among KSU faculty members (see Figure 2).
Figure 2. Research model (adopted from Davis, 1989).

Research Questions and Hypotheses

This study examined faculty members’ behavioral intention to use mobile learning as a tool for educational purposes at KSU in Riyadh, Saudi Arabia. I investigated the following research questions and hypotheses:

1. To what extent do perceived usefulness and perceived ease of use predict faculty members’ behavioral intention to use mobile learning for educational purposes?
2. To what extent does gender moderate the relationships between 1) perceived usefulness and faculty members’ perceived ease of use, and 2) faculty members’ behavioral intention to use mobile learning for educational purposes?
3. To what extent does age moderate the relationships between 1) perceived usefulness and faculty members’ perceived ease of use, and 2) faculty members’ behavioral intention to use mobile learning for educational purposes?
The following research hypotheses will guide this study:

H1: Perceived usefulness is positively related to faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H2: Perceived ease of use is positively related to faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H3: Gender moderates the relationship between perceived usefulness and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H4: Gender moderates the relationship between perceived ease of use and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H5: Age moderates the relationship between perceived usefulness and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H6: Age moderates the relationship between perceived ease of use and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

Participants and Sampling

The participants in this study consisted of all male and female faculty members across all colleges KSU in Riyadh, Saudi Arabia. I utilized a convenience-sampling strategy. According to Creswell (2015), “The researcher selects individuals because they are available, convenient, and represent some characteristic the investigator seeks to study” (p. 145). The sample size of this study was determined by using the G*Power analysis. According to Erdfelder et al. (1996), the G*Power analysis is an interactive statistical program that is used by researchers to determine the
minimum sample size based on the number of variables that are included in the study. According to the outcome and predictor variables that are included in this proposed study, the outcome of using the G*Power analysis suggested that a minimum of 119 participants would be required to achieve 95% power of detecting a moderate effect size in the population (Appendix A).

Instrumentation

I used an online TAM survey as the research instrument to collect data from faculty members at KSU. Creswell (2015) defines a survey as a tool administered by investigators in quantitative research to help groups of people articulate their attitudes, feelings, characteristics, and perceptions toward the research problem. Davis et al. (1989) developed the original TAM survey using a 5-point Likert scale for each item, with responses ranging from “Strongly Disagree” to “Strongly Agree.” Each item represents an indicator of an individual’s behavioral intention toward the two main constructs of TAM, which are PU and PEU (Davis et al., 1989). This study used an existing survey instrument that was developed by Davis et al. (1989). I received Davis’s permission to use as well as modify the survey instrument to conduct the current study (Appendix B). Consequently, the survey instrument followed Davis’s original survey instrument with slight modifications of items to be applied to the proposed study. The adopted survey instrument included a 16-item tool to measure the user’s behavioral intention to use mobile learning as a tool for educational purposes. The construct of PU had seven items, the construct of PEU had five items, and the construct of perceived behavioral intention had four items (Table 1). The items associated with these three constructs were coded from 5 = Strongly Agree to 1 = Strongly Disagree. Gender, age, academic rank, and years of experience were included in the section of participants’ demographic information (Appendix C).
Table 1
Constructs of the Survey Scale Assessing the Constructs of the TAM

<table>
<thead>
<tr>
<th>Construct</th>
<th>Purpose</th>
<th>Items</th>
<th># of Items</th>
</tr>
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| Perceived Usefulness | How faculty members think that using mobile learning tools would increase their skills and knowledge about their works | 1. Using mobile learning improves my performance.  
2. Using mobile learning saves my time.  
3. Using mobile learning enables me to accomplish educational tasks more quickly.  
4. Using mobile learning enhances my effectiveness in the educational process.  
5. Using mobile learning increases my productivity.  
6. Using mobile learning as a tool improves the quality of the work I do.  
7. Overall, I find mobile learning useful as a tool for educational purposes in my workplace. | 7          |
| Perceived Ease of Use| The extent to which a faculty member thinks that mobile learning is easy and flexible to use. | 1. Learning to use mobile learning as a tool is easy for me.  
2. It is easy for me to become proficient in using mobile learning as a tool for educational purposes.  
3. My interaction with mobile learning as a tool is easy for me to understand.  
4. It would be easy for me to become skillful at using Mobile Learning as a tool.  
5. Overall, I find Mobile Learning as a tool easy to use. | 5          |
| Behavioral Intention | Faculty members’ behavioral intents to use mobile learning.               | 1. I intend to use mobile learning as a tool for educational purposes.  
2. I intend to use mobile learning as a tool frequently for all teaching purposes.  
3. I am proud about using the mobile learning as a tool for educational purposes.  
4. Overall, I intend to use mobile learning as a tool for teaching purposes in the future. | 4          |
The primary purpose of the TAM survey instrument was to investigate how users come to accept new technology. For this reason, it was essential to ensure the TAM items of the instrument were valid to measure what they intended to measure. Exploring previous studies that have used the TAM survey instrument was an effective way of examining the validity of the evidence. Several studies have shown the high validity of the TAM instrument to measure users’ behavioral intention to use new actual systems (Fathema et al., 2015; King & He, 2006; Teeroovengadum et al., 2017).

The reliability and validity of the TAM survey instrument have been proven in seminal studies (Davis et al., 1989; Fathema et al., 2015). Fathema et al. (2015) successfully utilized the TAM to investigate the use of the learning management system (LMS) by faculty members in higher educational settings. The value of Cronbach’s alpha ranged from 0.87 to 0.96 for all eight scales. The reliability of PU was 0.96, and the reliability was 0.93 for PEU. This provides significant evidence of the reliability and validity of the TAM instrument in previous studies (Fathema et al., 2015). In addition, Teeroovengadum et al. (2017) recommended the TAM instrument to be used in future research due to the evidence of high reliability and validity. Even though previous research ensured the reliability of the TAM survey instrument, I conducted a pilot study with 20 participants to ensure the reliability of the new modified survey instrument.

**Threats to Validity**

There were some potential threats to validity in this study. The first potential threat was related to the TAM instrumentation. I translated the research instrument into Arabic because it was the participants’ native language and the predominant language in Saudi Arabia. Consequently, the participants’ responses might have been affected by the accuracy of the
translation and could have led the participants to provide ambiguous responses or skewed results. To help ensure the accuracy of the translated survey items, a back-translation process was implemented. First, I translated the original survey items into Arabic. The survey was sent to a third-party translator who was fluent in both Arabic and English to translate the Arabic survey items back to English. Then, I compared the original and the translated survey items to ensure the accuracy of the translated survey.

A second potential threat to validity can occur when a participant fails to respond to some or all of the items, in which case the survey will be impacted by nonresponse error, creating the possibility of missing data during the data collection phase (Azur et al., 2011). Consequently, I dealt with the missing data before the analysis phase. To solve the missing data problem, I applied a hot-deck imputation technique, a method in which the researcher uses observed responses from a similar unit to replace each missing value (Kim & Fuller, 2004).

**Ethical Principles and Human Subject Compliance**

To conduct this study, I obtained all the necessary approvals before creating the online survey. After receiving the CITI training certificate for social and behavioral research, I completed and submitted an application to the Northern Illinois University Institutional Review Board (IRB) (Appendix D). In order to assess the reliability of the data collection instrument, I conducted a pilot study that consisted of 20 participants who were not from the accessible sample to ensure the consistency of the constructs of the modified instrument items using Cronbach’s alpha coefficients. I used the outcome of the pilot study to ensure the content clarity of the modified instrument items for participants. Afterwards, I contacted the Questionnaire
Center (QC) at KSU and sent a copy of IRB approval to receive their permission to conduct the study.

Once approval was received from the IRB and the QC, I developed an online survey, using Qualtrics through NIU’s main website. Qualtrics is a web-based survey tool that enables researchers to conduct accessible online surveys. All participant responses were kept confidential because I saved data in a password-protected laptop. Participants were asked to read through the informed consent form (Appendix E) before beginning the survey. Both the purpose of the study and the researcher’s contact information were provided at the beginning of the survey. If the participant agreed to participate in the study, they clicked on the “Agree” button. Participants also had the right to stop the survey and withdraw from the study at any time.

In this study, I followed ethical principles. I informed all respondents regarding the privacy of their responses. Faculty members who were participating in this study were asked not to reference any information that could be used to identify them. Second, I secured and stored the acquired data to ensure the privacy of these data. After completing this study, I will dispose of all participants’ survey responses after five years.

Procedures and Data Collection

After receiving all approvals and the results of the pilot study, I sent the survey link to the QC at KSU. I used the research survey to gather information from both male and female faculty members who work at KSU, Riyadh, Saudi Arabia. The survey research instrument was used to collect the data. Each participant received a survey link via email to participate in the study. As indicated on the informed consent form, the QC at KSU was responsible for the process of distributing the instruments as a survey link via email to KSU faculty members along with a brief
explanation of the purpose of the study. I ensured that the QC at KSU included the consent form that contained a clear description as well as the importance of the research study for each participant. Each consent form was preceded by a cover letter that included my contact information. This information helped participants contact me to clarify unclear points and answer questions.

Data Analysis

I used the Statistical Package for Social Science (SPSS) to analyze the data. SPSS is used by researchers to analyze statistical data related to quantitative studies. This study applied two main statistical approaches using SPSS: descriptive statistics and inferential statistics. Descriptive analysis was used to help summarize the information collected from the study’s sample. It also helped describe the features of different items in the study. The mean, median, mode, and standard deviation were used to describe the quantitative variables in this study through bar graphs and histograms.

Multiple linear regression, an inferential analytic approach, was utilized to assess how PU and PEU predicted faculty members’ behavioral intention to use online mobile learning. This regression was also to assess how gender and age moderated the relationship among PU and PEU and faculty members’ behavioral intention to use mobile learning. Scatterplots presented the relationship between variables that were included in this study.

Chapter Summary

The primary purpose of this study was to investigate how PU and PEU predicted faculty members’ behavioral intention to use mobile learning. This research also investigated whether
gender and age moderated the relationship between PU and PEU and faculty members’ behavioral intention and used a quantitative survey method to collect and analyze the data. The participants were faculty members from King Saud University in Riyadh, Saudi Arabia. I used convenience sampling as a research sample design. The study instrument was an online survey that consisted of 16 items created using Qualtrics, a web-based survey tool. I ensured the validity of the survey instrument by using a back-translation technique for the survey questions and applying imputation techniques to accommodate potential missing data. I used SPSS to obtain descriptive statistics and inferential statistics. Finally, this chapter described ethical principles, research procedures, and data analysis methods.
CHAPTER 4
RESULTS

The two purposes of this quantitative correlational study were to investigate how the TAM constructs PU and PEU predict faculty members’ behavioral intention to use mobile learning for educational purposes at KSU in Riyadh, Saudi Arabia, and to examine whether gender and age moderated the relationship between the TAM constructs and behavioral intention to use mobile learning. This chapter presents the data analysis and results that were conducted to address the research questions and hypotheses.

Data Screening

After the IRB at Northern Illinois University approved conducting the study, an email with the survey link was sent to the Deanship of Scientific Research at King Saud University for them to send to all faculty members at KSU as emails. The online survey asked for participants’ gender, age, college, educational level, academic rank, years of teaching experience, level of satisfaction of using mobile devices, nationality, and the three constructs of the TAM (PU, PEU, and behavioral intention). Two hundred and nine faculty members responded to the survey. Data were screened and missing values identified. To assess whether the missing values were missing completely at random (MCAR), I conducted Little’s (1988) MCAR test. The MCAR test results revealed that missing data were missing completely at random ($p = .700$). Thirteen cases were removed from the data set due to various reasons, such as agreeing to participate in the study but leaving the survey without providing any response, responding solely to the demographic items,
or providing responses that included many missing values. A hot-deck imputation technique was used to impute missing values for those cases with relatively few missing values. The final analytic data set was comprised of 196 cases.

Demographic Information

This section provides descriptive information about faculty members at KSU, such as gender, age, educational level, colleges, academic ranks, years of experience, skills level using mobile devices, and participant’s nationality. Gender distribution can be seen in Table 2.

Table 2

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>113</td>
<td>57.7</td>
</tr>
<tr>
<td>Female</td>
<td>83</td>
<td>42.3</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Age was included as a variable because it varies from one university to another as well as to provide information about the sample’s age range. Participants were asked to choose from four age ranges: 23-30, 31-40, 41-60, and more than 60 years. Table 3 shows the participants’ age distribution. Table 4 shows the participants’ college affiliation, science, health, or humanities, and Table 5 shows the participants’ education level: bachelor’s, master’s, or PhD/EdD. Five choices were provided to participants to indicate their academic ranks as faculty member: teaching assistant, lecturer, assistant professor, associate professor, professor. Table 6 shows the participants’ academic rank distribution.
Table 3

Participant Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 – 30 Years</td>
<td>19</td>
<td>9.7</td>
</tr>
<tr>
<td>31 – 40 Years</td>
<td>84</td>
<td>42.9</td>
</tr>
<tr>
<td>41 – 60 Years</td>
<td>82</td>
<td>41.8</td>
</tr>
<tr>
<td>More than 60 Years</td>
<td>11</td>
<td>5.6</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4

Participant College Affiliation

<table>
<thead>
<tr>
<th>College</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Colleges</td>
<td>43</td>
<td>22</td>
</tr>
<tr>
<td>Health Colleges</td>
<td>53</td>
<td>27</td>
</tr>
<tr>
<td>Humanities College</td>
<td>100</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 5

Participant Education Level

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s Degree</td>
<td>14</td>
<td>7.1</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>63</td>
<td>32.1</td>
</tr>
<tr>
<td>PhD / EdD Degree</td>
<td>119</td>
<td>60.8</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 6

Participant Academic Rank

<table>
<thead>
<tr>
<th>Academic Rank</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Assistant</td>
<td>29</td>
<td>14.8</td>
</tr>
<tr>
<td>Lecturer</td>
<td>46</td>
<td>23.5</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td>53</td>
<td>27.0</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>32</td>
<td>16.3</td>
</tr>
<tr>
<td>Professor</td>
<td>36</td>
<td>18.4</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Five choices were provided to participants to indicate their years of experience working as a faculty member: less than 5 years, 5-10 years, 11-15 years, 16-20 years, and 21 or more years. Table 7 shows the participants’ years of experience.

Table 7

Participant Years of Experience

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5 years</td>
<td>46</td>
<td>23.5%</td>
</tr>
<tr>
<td>5 to 10 Years</td>
<td>48</td>
<td>24.5%</td>
</tr>
<tr>
<td>11 to 15 Years</td>
<td>29</td>
<td>14.8%</td>
</tr>
<tr>
<td>16 to 20 Years</td>
<td>31</td>
<td>15.8%</td>
</tr>
<tr>
<td>21 or more years</td>
<td>42</td>
<td>21.4%</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100 %</td>
</tr>
</tbody>
</table>

The seventh survey item indicated the participants’ skill level of using mobile devices. Participants were asked to evaluate their skills based on a 5-point Likert scale that ranged from
“very satisfied” to “very dissatisfied.” Table 8 shows participant satisfaction with mobile devices skills.

Table 8

Distribution of Satisfaction with Mobile Devices Skills

<table>
<thead>
<tr>
<th>Satisfaction with Mobile Devices Skills</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Dissatisfied</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Dissatisfied</td>
<td>5</td>
<td>2.6</td>
</tr>
<tr>
<td>Neither satisfied nor dissatisfied</td>
<td>13</td>
<td>6.6</td>
</tr>
<tr>
<td>Satisfied</td>
<td>112</td>
<td>57.1</td>
</tr>
<tr>
<td>Very Satisfied</td>
<td>63</td>
<td>32.1</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100.0</td>
</tr>
</tbody>
</table>

King Saud University is classified as one of the largest universities in Saudi Arabia, and it has many faculty members, both Saudi citizens and from other countries. The last item in the demographic section of the survey was created to identify participants’ nationality. Table 9 shows the participant nationality.

Table 9

Participant Nationality

<table>
<thead>
<tr>
<th>Nationality</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saudi</td>
<td>179</td>
<td>91.3</td>
</tr>
<tr>
<td>Non-Saudi</td>
<td>17</td>
<td>8.7</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Descriptive Statistics

TAM Constructs

Likert scales were used in this quantitative study in which participants specified their level of agreement to different statements using response options: 5 = “strongly agree,” 4 = “agree,” 3 = “neutral,” 2 = “disagree,” and 1 = “strongly disagree” for items corresponding to each of the three constructs: PU, PEU, and behavioral intention (BI) of the TAM. Composite scores were computed as the mean score across items for each construct of the TAM. Table 10 presents the descriptive statistics (mean, standard deviation, skewness, and kurtosis) across participants for the three subscale constructs (PU, PEU, and BI). At the sample level, the composite scores for perceived ease of use items showed the highest mean value ($M = 4.11$, $SD = 0.66$), which indicates that participants had a level of high agreement about perceived ease of use and its impact on using mobile learning for educational purposes. Perceived usefulness showed the second-highest mean score ($M = 4.01$, $SD = 0.75$), which indicates that participants perceive mobile learning as a useful tool that will increase their effectiveness in the educational process. Finally, the lowest mean score was for behavioral intention ($M = 3.95$, $SD = 0.84$), which indicates that participants had a neutral intention to use mobile learning in the future for educational purposes.

Table 10
Descriptive Statistics of the TAM

<table>
<thead>
<tr>
<th>Variable</th>
<th>$N$</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness</td>
<td>196</td>
<td>4.07</td>
<td>0.66</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>196</td>
<td>4.01</td>
<td>0.75</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>196</td>
<td>3.95</td>
<td>0.84</td>
</tr>
</tbody>
</table>
Figure 3 presents boxplots of the three constructs of the included variables in this study based on the TAM (PU, PEU, and BI). The boxplots show that each variable had outliers; in particular, two cases for PU were classified as extreme values (case number 118 and case number 43). The extreme values for perceived usefulness (PU) were truncated to the next-nearest outlying case.

![Figure 3. Boxplots for TAM constructs.](image1)

The extreme values for perceived usefulness (PU) were truncated to the next-nearest outlying case. For example, the values of perceived usefulness for case numbers 118 and 43 were truncated to a value equal to that of case number 128 (Figure 4).

![Figure 4: Boxplot for transformed TAM construct](image2)
Reliability of Instrument Scores

Because some of the survey items were modified from the original instrument, it was important to assess the internal consistency of scores obtained from the survey. According to Bland and Altman (1997), Cronbach’s alpha provides evidence of internal consistency reliability. As shown in Table 11, the value of Cronbach’s alpha for the TAM constructs (PU, PEU, and BI) indicated good reliability evidence with a value above 0.70 (Gliem & Gliem, 2003).

Table 11

<table>
<thead>
<tr>
<th>Construct</th>
<th>Corresponding Items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness</td>
<td>1-7 (7 items)</td>
<td>.94</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>8-12 (5 items)</td>
<td>.93</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>13-16 (4 items)</td>
<td>.91</td>
</tr>
</tbody>
</table>

Inferential Statistics

Linear regression was used to assess the effect of each construct of the Technology Acceptance Model that was used in this study.

Research Question 1

This section examines the findings of the Research Question 1 and its associated hypotheses that examined perceived usefulness and perceived ease of use for predicting faculty members’ behavioral intention to use mobile learning for educational purposes at King Saud University in Riyadh, Saudi Arabia.
RQ1: To what extent do perceived usefulness and perceived ease of use predict faculty members’ behavioral intention to use mobile learning for educational purposes?

H1: Perceived usefulness is positively related to faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H2: Perceived ease of use is positively related to faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

Multiple Linear Regression Analysis

To assess Research Question 1, I used multiple regression, predicting the outcome variable (faculty members’ behavioral intention) and from the predictor variables (PU and PEU). Gender and age served as control variables in this model.

Tables 12 presents the results for the regression of faculty members’ behavioral intention to use mobile learning for educational purposes on PU and PEU. The results show that the full set of predictors (gender, age, PU, and PEU) significantly predicted faculty members’ behavioral intention, $F(4, 191) = 87.260, p < .001$. A total of 59.8% of the faculty members’ behavioral intention variation was explained by full set of predictors ($R^2 = .598$) while, after controlling for age and gender, PU and PEU combined were statistically significant predictors $F(4, 191) = 87.260, p < .001$, accounting for 59.8% of the total variation in the outcome variable (see Table 13).
Table 1

ANOVA for Regression of Behavioral Intention on PU, PE, Age, and Gender

<table>
<thead>
<tr>
<th>Model</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>88.933</td>
<td>4</td>
<td>22.233</td>
<td>87.260</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Residual</td>
<td>48.66</td>
<td>191</td>
<td>0.255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>137.59</td>
<td>195</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Outcome Variable: Behavioral Intention

Table 13

Regression Model Summary Predicting Behavioral Intention

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.220</td>
<td>.049</td>
<td>.039</td>
<td>.823</td>
<td>.049</td>
<td>4.929</td>
</tr>
<tr>
<td>2</td>
<td>.804</td>
<td>.646</td>
<td>.639</td>
<td>0.5</td>
<td>.598</td>
<td>87.260</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), age, gender
b. Predictors: (Constant), age, gender, Perceived Ease of Use, Perceived Usefulness
c. Dependent Variable: Behavioral Intention

Coefficients

Evaluation of the regression coefficients (Table 14) revealed that after controlling for gender and age, PU and PEU each had a statistically significant, positive relationship with behavioral intention [$\beta = 0.738, p < .001$, and $\beta = 0.102, p = .035$, respectively]. Furthermore, gender and age each were not statistically significant predictors [$\beta = 0.064, p = <.141$, and $\beta = 0.050, p = .319$, respectively]. Finally, to assess which predictor was most important, Pratt indices were computed. The results revealed that the Pratt index for PU was 0.91 and the Pratt index for PEU was 0.07, which indicated that PU was the most important of the predictors.
Table 14

Regression Coefficients for the Regression of Behavioral Intention on PU, PEU, Age, and Gender

<table>
<thead>
<tr>
<th>Predictors</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>Pratt Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>0.163</td>
<td>0.303</td>
<td>-</td>
<td>0.536</td>
<td>.539</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.109</td>
<td>0.074</td>
<td>0.064</td>
<td>1.479</td>
<td>.141</td>
<td>0.01</td>
</tr>
<tr>
<td>Age</td>
<td>-0.050</td>
<td>0.050</td>
<td>-0.044</td>
<td>-0.999</td>
<td>.319</td>
<td>0.01</td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>0.827</td>
<td>0.055</td>
<td>0.738</td>
<td>15.161</td>
<td>&lt;.001</td>
<td>0.91</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>0.129</td>
<td>0.061</td>
<td>0.102</td>
<td>2.127</td>
<td>.035</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Regression Assumptions

Regression assumptions, including homoscedasticity, normality of residuals, and linearity were assessed. Additionally, regression outliers and influential values were identified, and multicollinearity among predictors was assessed.

Outliers and Influential Values. Examination of regression outliers showed that the standardized residuals ranged in value between -2.941 and 2.981, with no values exceeding +/-3.00. Also, Cook’s Distances revealed that influential cases were not evident, with no values exceeding 1.0.

Homoscedasticity. As shown in Figure 5, the assumptions of homoscedasticity were met based on the visual examination of the total behavioral intention’s scatterplot on the predicted values. The scatterplot showed that the residuals were homoscedastic.
Normality of Residuals. A histogram of standardized residuals and the P-P plot were constructed to assess the normality of residuals. As shown in Figure 6, the histogram presented some departure from a normal distribution. This observation was also supported by examining the residual P-P plot (Figure 7). However, the results showed that residuals did not display extreme skewness or kurtosis, with skewness = -0.103 (SE = 0.174) and kurtosis = 0.519 (SE = 0.346). Moreover, the large sample size mitigated concerns about non-normality.

Figure 5: Scatterplot of residual values on predicted values.

Figure 6. Histogram of standardized residuals.
Figure 7: Normal P-P plot of regression standardized residuals.

**Multicollinearity.** Multicollinearity is suggested if the VIF is greater than 10 or, equivalently, if the tolerance value is less than 0.10 for predictor variables (O’Brien, 2007). The value of VIF for both each predictor was below 10, and both values of tolerance were less than 0.10. Thus, excessive multicollinearity was not evident. Furthermore, no correlations among the predictors exceeded .90 (Table 15).

Table 15

Pearson Correlations Among Predictors

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Gender</th>
<th>Perceived Usefulness</th>
<th>Perceived Ease of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-.125*</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>-.193**</td>
<td>.037</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>-.131*</td>
<td>.025</td>
<td>.446***</td>
<td>1.000</td>
</tr>
</tbody>
</table>

N=196; *p < .05, **p < .01, ***p < .001
Research Question 2

This section provides the results related to Research Question 2, which examined whether gender moderated the relationships between PU, PEU, and faculty members’ behavioral intention to use mobile learning for educational purposes. A multiple linear regression model was fitted to address this research question. Prior to analysis, PU and PEU were mean-centered. The analyses addressed the following research question and hypotheses:

RQ2: To what extent does gender moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?

H3: Gender moderates the relationship between perceived usefulness and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H4: Gender moderates the relationship between perceived ease of use and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

Multiple Linear Regression Analysis

Table 16 shows the results for model assessing the moderating effect of gender on the relationship between PU and faculty members’ behavioral intention to use mobile learning for educational purposes. Results showed that gender did not significantly moderate this relationship ($\beta = -0.117, p = .241$). This model accounted for 23% of the total variation in the outcome ($R^2 = $)
Similarly, Table 17 shows the results for model assessing the moderation effect of gender on the relationship between PEU and faculty members’ behavioral intention to use mobile learning for educational purposes. Results showed that gender significantly moderated this relationship ($\beta = -0.165$, $p = .010$), and that this model accounted for 66% of the total variation in the outcome ($R^2 = .663$, $p < .001$). Figure 8 illustrates the nature of this moderation effect, where the relationship between PEU and faculty members’ behavioral intention to use mobile learning for educational purposes was stronger for males than for females.

Table 16
Regression Coefficients for Regression of Behavioral Intention on PU, Gender, and Moderator

<table>
<thead>
<tr>
<th></th>
<th>$B$</th>
<th>$SE (B)$</th>
<th>$Beta$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>3.946</td>
<td>0.036</td>
<td>108.343</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.120</td>
<td>0.074</td>
<td>0.071</td>
<td>1.633</td>
<td>.104</td>
</tr>
<tr>
<td>PU</td>
<td>0.884</td>
<td>0.049</td>
<td>0.451</td>
<td>7.087</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PU $\times$ Gender</td>
<td>-0.117</td>
<td>0.100</td>
<td>-0.051</td>
<td>-1.175</td>
<td>.241</td>
</tr>
</tbody>
</table>

Table 17
Regression Coefficients for Regression of Behavioral Intention on PEU, Gender, and Moderator

<table>
<thead>
<tr>
<th></th>
<th>$B$</th>
<th>$SE (B)$</th>
<th>$Beta$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>3.948</td>
<td>0.053</td>
<td>74.262</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.152</td>
<td>0.108</td>
<td>0.089</td>
<td>1.409</td>
<td>.160</td>
</tr>
<tr>
<td>PEU</td>
<td>0.570</td>
<td>0.080</td>
<td>0.239</td>
<td>3.710</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PEU $\times$ Gender</td>
<td>-0.416</td>
<td>0.161</td>
<td>-0.165</td>
<td>-2.586</td>
<td>.010</td>
</tr>
</tbody>
</table>
Figure 8: Interaction effect of gender on the relationship between PEU and behavioral intention.

Regression Assumptions

Regression assumptions, including homoscedasticity, normality of residuals, and linearity were assessed. Regression outliers and influential values were identified, and multicollinearity assessed.

Outlier and Influential Values. Examination of regression outliers for the model including the moderating effect of gender on the relationship between PU and the outcome showed that the standardized residuals ranged in value between -2.912 and 2.421, with no values exceeding
Additionally, the model assessing the moderating effect of gender on the relationship between PEU and the outcome showed standardized residuals ranging in value between -2.018 and 2.987, with no values exceeding +/- 3.00. Finally, Cook’s Distances revealed that influential cases were not evident, with no values exceeding 1.0 in either model.

**Homoscedasticity.** As shown in Figures 9 and 10, the assumptions of homoscedasticity were met based on the visual examination of the total behavioral intention’s scatterplot on the predicted values.

![Scatterplot of residual values on predicted values.](image1)

**Figure 9.** Scatterplot of residual values on predicted values.

![Scatterplot of residual values on predicted values.](image2)

**Figure 10:** Scatterplot of residual values on predicted values.
Normality of Residuals. A histogram of standardized residuals and P-P plot were constructed to assess normality of residuals for both models. As shown in Figure 11, the histogram presented some departure from a normal distribution for the first moderation model. This observation was also supported by examining the P-P plot (Figure 12). However, the results showed that residuals did not display extreme skewness or kurtosis, with skewness = -0.118 (SE = 0.174) and kurtosis = 1.711 (SE = 0.346). Similarly, Figure 13 showed a histogram that presented some departure from a normal distribution for the second moderation model. This observation was also supported by examining the P-Plot (Figure 14). But the results showed that residuals did not display extreme skewness or kurtosis, with skewness = -0.261 (SE = 0.174) and kurtosis = 1.251 (SE = 0.346). Lastly, the large sample size mitigated concerns about non-normality.

Figure 11. Histogram of Standardized Residuals (outcome variable behavioral intention).
Figure 12: P-P plot of the moderating effect of gender on the relationship between PU and behavioral intentions.

Figure 13: Histogram of Standardized Residuals (outcome variable: behavioral intention).

Figure 14: P-P plot of behavioral intention for modeling including moderating effect of gender on the relationship between PEU and behavioral intentions.
**Multicollinearity.** The value of VIF for each predictor was below 10, and the values of tolerance each were less than 0.10. Thus, excessive multicollinearity was not evident.

Furthermore, no correlations among the predictors exceeded .90 (Table 18).

Table 18

<table>
<thead>
<tr>
<th></th>
<th>PU</th>
<th>PEU</th>
<th>PU × Gender</th>
<th>PEU × Gender</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEU</td>
<td>.446</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU × Gender</td>
<td>-.063</td>
<td>.304</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEU × Gender</td>
<td>.278</td>
<td>.088</td>
<td>.445</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>.037</td>
<td>.025</td>
<td>.034</td>
<td>.008</td>
<td>1.000</td>
</tr>
</tbody>
</table>

* N = 196; *p < .05, **p < .01, ***p < .001.

**Research Question 3**

This section presents the results related to Research Question 3, which investigates whether age moderated the relationships between either PU or PEU and faculty members’ behavioral intention to use mobile learning for educational purposes. To address this question, I conducted multiple linear regression. As mentioned previously, the total sample size for this analysis was 196 participants. See Table 3 for the participants’ age range. To facilitate the analysis, age was recoded as a binary variable (23 to 40 years vs. 41 to more than 60 years.). PEU and PU were mean-centered, and product terms were created by multiplying the binary age variable by the centered scale scores (PU × age and PEU × age).

RQ3: To what extent does age moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile
learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?

H4: Age moderates the relationship between perceived usefulness and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

H5: Age moderates the relationship between perceived ease of use and faculty members’ behavioral intention to use mobile learning as a tool for educational purposes.

**Multiple Linear Regression Analysis**

As presented in Table 19, the combined set of predictors significantly predicted faculty members’ behavioral intention to use mobile learning for educational purposes $F(3, 192) = 111.602, \ p < .001$, with 63.6% of the variation in faculty members’ behavioral intention was explained by the predictors ($R^2 = .636$). Table 20 shows that the combined set of regression models was statistically significant and predicted faculty members’ behavioral intention to use mobile learning for educational purposes $F(3, 192) = 18.533, \ p < .001$. Furthermore, as shown in Table 21, 22.5% of the variation in faculty members’ behavioral intention was explained by the predictors ($R^2 = .225$).
Table 19
ANOVA for Regression of Behavioral Intention on PEU, Age, and Moderator

<table>
<thead>
<tr>
<th>Model</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>87.449</td>
<td>3</td>
<td>17.973</td>
<td>111.602</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Residual</td>
<td>50.149</td>
<td>192</td>
<td>.261</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>137.598</td>
<td>195</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 20
ANOVA for Regression of Behavioral Intention on PEU, Age, and Moderator

<table>
<thead>
<tr>
<th>Model</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>30.923</td>
<td>3</td>
<td>10.308</td>
<td>18.553</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Residual</td>
<td>106.675</td>
<td>192</td>
<td>.556</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>137.598</td>
<td>195</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 21
Regression Model Summary Predicting Behavioral Intention

<table>
<thead>
<tr>
<th></th>
<th>$R$</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.474</td>
<td>.225</td>
<td>.213</td>
<td>.47538</td>
</tr>
</tbody>
</table>

Coefficients

The regression coefficients were examined to evaluate each of the predictors and the effect of age as a moderator of the relationship between faculty members’ behavioral intention to use mobile learning for educational purposes and each of scale predictors (PU and PEU; Tables 22 and 23). The results showed that the impact of perceived usefulness on faculty members’
behavioral intention was not significantly moderated by age \((\beta = -.031, p = .649)\). Likewise, the effect of perceived ease on faculty members’ behavioral intention was not significantly moderated by age \((\beta = .086, p = .401)\).

Table 22
Regression Coefficients for Regression of Behavioral Intention on PU, Age, and Moderator

<table>
<thead>
<tr>
<th></th>
<th>(B)</th>
<th>(SE (B))</th>
<th>(Beta)</th>
<th>(t)</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>3.996</td>
<td>0.051</td>
<td>78.063</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.112</td>
<td>0.074</td>
<td>-0.067</td>
<td>-1.514</td>
<td>.132</td>
</tr>
<tr>
<td>PU</td>
<td>0.904</td>
<td>0.076</td>
<td>0.806</td>
<td>11.887</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PU × Age</td>
<td>-0.046</td>
<td>0.100</td>
<td>-0.031</td>
<td>-0.456</td>
<td>.649</td>
</tr>
</tbody>
</table>

Table 23
Regression Coefficients for Regression of Behavioral Intention on PEU, Age, and Moderator

<table>
<thead>
<tr>
<th></th>
<th>(B)</th>
<th>(SE (B))</th>
<th>(Beta)</th>
<th>(t)</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>4.084</td>
<td>0.074</td>
<td>55.503</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.285</td>
<td>0.107</td>
<td>-0.170</td>
<td>-2.665</td>
<td>.008</td>
</tr>
<tr>
<td>PEU</td>
<td>0.488</td>
<td>0.102</td>
<td>0.386</td>
<td>4.802</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>PEU × Age</td>
<td>0.140</td>
<td>0.166</td>
<td>0.068</td>
<td>0.842</td>
<td>.401</td>
</tr>
</tbody>
</table>

Regression Assumptions

Regression assumptions, including homoscedasticity, normality of residuals, and linearity were assessed. Additionally, regression outliers and influential values were identified.

Outlier and Influential Values. Examination of regression outliers or the model including the moderating effect of age on the relationship between PU and the outcome showed that the
standardized residuals ranged in value between -2.851 and 2.939. Additionally, the model including the moderating effect of age on the relationship between PEU and the outcome showed standardized residuals ranging in value between -3.118 and 2.620, with only one case was more extreme than +/-3.00. Also, Cook’s Distances showed that influential cases were not evident, with no values exceeding 1.0.

**Normality of Residuals.** A histogram of standardized residuals and the P-P plot were constructed to assess the normality of residuals. As shown in Figure 15, the histogram presented some departure from a normal distribution. This observation was also supported by examining the residual P-P plot (Figure 16). However, the results showed that residuals did not display extreme skewness or kurtosis, with skewness = -1.689 (SE = 0.174) and kurtosis = 7.216 (SE = 0.346). Similarly, Figure 17 showed a histogram that presented some departure from a normal distribution for the second model. But the results showed that residuals did not display extreme skewness or kurtosis, with skewness = -0.827 (SE = 0.174) and kurtosis = 6.697 (SE = 0.346). This observation was also supported by examining the P-Plot (Figure 18). Lastly, the concerns about non-normality were mitigated due to the large sample size.

![Figure 15. Histogram of standardized residuals.](image)
Figure 16: P-P plot of behavioral intention for modeling including moderating effect of age on the relationship between PU and faculty members’ behavioral intention.

Figure 17: Histogram of standardized residuals.

Figure 18. P-P plot of behavioral intention for modeling including moderating effect of age on the relationship between PEU and faculty members’ behavioral intention.
Homoscedasticity. As shown in Figures 19 and 20, the assumptions of homoscedasticity have been met based on the visual examination of the total behavioral intention’s scatterplot on the predicted values. The scatterplot for both models showed that the residuals were homoscedastic.

![Figure 19: Scatterplot of residual values on predict values.](image1)

![Figure 20: Scatterplot of residual values on predict values.](image2)

Multicollinearity. The value of VIF for all predictors was below 10, and all values of tolerance were less than 0.10. Thus, excessive multicollinearity was not evident. Furthermore, no correlations among the predictors exceeded .90 (Table 24).
Table 24

Correlations Among Predictors

<table>
<thead>
<tr>
<th></th>
<th>PU</th>
<th>PEU</th>
<th>PU × Age</th>
<th>PEU × Age</th>
<th>Age</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEU</td>
<td>.446</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU × Age</td>
<td>.762</td>
<td>.115</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEU × Age</td>
<td>.125</td>
<td>.612</td>
<td>.582</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-.170</td>
<td>-.068</td>
<td>-.118</td>
<td>-.059</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

N = 196; *p < .05, **p < .01, ***p < .001.

Chapter Summary

This quantitative correlational study was designed to examine how the TAM constructs PU and PEU predicted faculty members’ behavioral intention to mobile learning at KSU among faculty members in Riyadh, Saudi Arabia. It also examined whether gender and age moderated the relationship between PU and PEU and behavioral intention to mobile learning for educational purposes.

This chapter’s first section presented information regarding the study’s participants and constructs/variables that were used. The second section provided inferential statistical analysis related to the study’s research questions using multiple linear regression.

Research Question 1 was, “To what extent do perceived usefulness and perceived ease of use predict faculty members’ behavioral intention to use mobile learning for educational purposes?” The results revealed that the two predictors, PU and PEU, significantly and positively predicted faculty members’ behavioral intentions. The regression model showed that the two predictors explained 59.8% of variation in faculty members’ behavioral intention.
Research Question 2 was, “To what extent does gender moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?” The results from multiple regression analyses showed that gender did not show a statistically significant moderating effect on the relationship between PU and faculty members’ behavioral intention to use mobile learning for educational purposes. Interestingly, gender had a statistically significant moderating effect on the relationship between PEU and faculty members’ behavioral intention to use mobile learning. The relationship between PEU and faculty members’ behavioral intention to use mobile learning for educational purposes was slightly stronger for males than females.

Research Question 3 was, “To what extent does age moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?” The results showed that the relationship between both PU and PEU and faculty members’ behavioral intention was not significantly moderated by age. The next chapter will discuss the results of this study.
CHAPTER 5
DISCUSSION

This chapter presents a discussion of the results from the data analyses conducted on faculty members’ behavioral intention to use mobile learning for educational purposes and how the results of this study are related to previous literature findings. It also describes limitations of this study, implications for policymakers and instructional technology designers in the higher education sector in the kingdom of Saudi Arabia, and provides suggestions for future research.

Overview of the Study

This quantitative study aimed to investigate faculty members’ behavioral intentions to use mobile learning for educational purposes at KSU in Riyadh, Saudi Arabia. Gender and age were considered to see whether these two variables were related to faculty members’ behavioral intentions to use mobile learning and whether they moderated the predictive relationships between PU and PEU.

This study was guided by the TAM as a theoretical framework. According to Davis (1989), PU and PEU are two main constructs that predict individuals’ behavioral intention to use new technology. An online survey was created and sent to participants. The first section of the survey was designed to gather demographic information, such as participants’ gender, age, college, educational level, academic rank, years of teaching experience, level of satisfaction of using mobile devices, and nationality. Although demographic information was collected for all of the categories, for the purpose of this study only gender and age categories were included in
the analysis because they are critical factors to consider in the context of Saudi higher education.

The second section was related to faculty members’ behavioral intention to use mobile learning for educational purposes based on the TAM constructs.

The sample of this study targeted faculty members who work at KSU in Saudi Arabia, and their data was utilized for both descriptive and inferential statistics. Research questions’ findings are discussed and connected to the literature review.

Research Question 1

To what extent do perceived usefulness and perceived ease of use predict faculty members’ behavioral intention to use mobile learning for educational purposes?

The first research question aimed to investigate faculty members’ behavioral intentions to use mobile learning tools for educational purposes at KSU in Riyadh, Saudi Arabia. The two predictor variables in the TAM were hypothesized as the main predictors of the behavioral intention to use mobile learning for educational purposes. Multiple linear regression was used to examine the outcome variable’s relationship (faculty’s behavioral intention) and predictor variables (PU and PEU) to use mobile learning for educational purposes. This study’s findings revealed that PU and PEU were statistically significant positive predictors of faculty members’ behavioral intention to use mobile learning tools for educational purposes at KSU. The regression model output revealed 64% of the variation in faculty members’ behavioral intention was explained by perceived usefulness and perceived ease. These results were consistent with previous studies conducted by Aljuaid et al. (2014), Jung (2015), Mac Callum et al. (2014), Sariçoban (2013), Schlag and Imhof (2017), Teeroovengadum et al. (2017), Wong et al. (2013),
and Yeni and Gecu-Parmaksiz (2016) who found that both PU and PEU predicted the behavioral intention to use mobile learning for teaching or learning purposes.

It was apparent that a high percentage of faculty members (64%) in this study were willing to use mobile learning for educational purposes. Consequently, decision makers in the higher education setting need to consider their faculty members’ behavioral intentions to use mobile learning tools before encouraging them to use them for educational purposes. Each predictor is discussed below and linked with the previous studies that utilized the TAM to predict individuals’ behavioral intention to use portable technological devices, such as laptops, tablets, and smartphones in the learning process.

**Perceived Usefulness**

According to Davis (1989), PU refers to “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989, p. 320). Based on the values of the Pratt Index computed in this study, PU was the most important predictor of behavioral intention to use mobile learning tools for educational purposes among faculty members at KSU. This finding supported the first hypothesis because faculty members’ behavioral intention is positively predicted by the perceived usefulness of using mobile learning for educational purposes. Furthermore, this finding is consistent with previous research studies conducted by Aljuaid et al. (2014), Mac Callum et al. (2014), Sariçoban (2013), Wong et al. (2013), and Yeni and Gecu-Parmaksiz (2016), in which it was confirmed that PU was the most critical predictor of users’ behavioral intention. Thus, faculty members are more likely to have better intentions to use mobile learning for educational purposes when they find it useful tools that enhance their job performance in the learning process. Faculty members' job performance in
the current study refers to their responsibilities of developing and delivering courses, assessing student learning, providing feedback, and mentoring students. Effective teaching involves creating a supportive and inclusive learning environment, engaging students in active learning, and promoting critical thinking and problem-solving skills. Aljuaid et al. (2014) and Wong et al. (2013) mentioned the importance of considering mobile learning’s usefulness for instructors in different learning settings to increase their intentions to use mobile learning for educational purposes. Mac Callum et al. (2014) reported that lecturers tend to adopt mobile learning if it fosters students’ learning and provides different channels that promote the communication process. Therefore, I suggest that universities focus on PU as a substantial factor to attract faculty members to use mobile learning for educational purposes. One of the recommendations provided to decision-makers is that it is essential to make sure that the mobile learning management system that the faculty will use must be usable, user-friendly, and compatible with the faculty’s personal mobile devices (e.g., smartphones, tablets, laptops).

**Perceived Ease of Use**

PEU, which is similar to the effort expectancy construct in the unified theory of acceptance and use of technology, is defined as “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p. 320). In this study, participants were asked questions related to the ease of using mobile learning for educational purposes. The findings of this study supported the second hypothesis. The results showed that PEU was a statistically significant positive predictor of faculty members’ behavioral intention to use mobile learning for educational purposes and had a positive relationship with the faculty members’ behavioral intention to use mobile learning for educational purposes.
The current study’s findings aligned with previous research studies by Jung (2015), MacCallum et al. (2014), Schlag and Imhof (2017), and Teeroovengadum et al. (2017) that considered PEU as a predictor that is related to users’ behavioral intention. I believe faculty members at KSU tend to use mobile learning tools in the learning process when they have the important skills needed to use mobile learning and do not require much time and effort to use these tools for educational purposes. Educators might believe using mobile learning for educational purposes is valuable for them and their students, but they tend not to use it due to the difficulty of use. Thus, it is recommended to design user-friendly mobile learning services, e.g., arrangement of text and pictures to be relevant to users' culture and language, use of symbols, the appropriate structure of system navigation/interface, and color relevant to local culture, to encourage users to use mobile learning devices for a learning process.

In contrast, this study’s results are inconsistent with previous studies conducted by Chaka and Govender (2020) and Yeni and Gecu-Parmaksiz (2016). Their findings revealed that PEU was not a predictor of individuals’ behavioral intention to use new technology. Many reasons might explain this contradiction, such as skills set in the current study, techniques of sampling selection, procedure of data collection, and study site. For example, Chaka and Govender (2020) found no statistically significant relationship between PEU and behavioral intention among lecturers from the college of education in Nigeria. In Chaka and Govender’s (2020) study, participants were lecturers, and they used mobile devices as a medium for learning and teaching. According to Chaka and Govender (2020), the reason PEU was not significant was because the participants considered stakeholders’ opinions and the availability of an internet connection more than the impact of PEU and PU to use mobile devices for learning and teaching purposes. In Yeni and Gecu-Parmaksiz’s (2016) study, PEU was not a significant predictor of behavioral
intention, possibly due to the lack of training to use ICT tools for learning and teaching purposes. Based on these studies’ results, I believe that the availability of internet service and providing a user-friendly interface for mobile learning devices as well as training programs to prepare faculty members for using mobile learning for educational purposes would encourage them to do so. When faculty members are prepared to use mobile learning devices, it will help them to facilitate their communication and teaching for their students because using mobile devices enable faculty members to connect with students easily, such as posting announcements, providing immediate feedback, and sending reminders regarding upcoming course information.

Research Question 2

To what extent does gender moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?

H3: Gender moderates the relationships between perceived usefulness and faculty members’ behavioral intention to use mobile learning for educational purposes.

H4: Gender moderates the relationships between perceived ease of use and faculty members’ behavioral intention to use mobile learning for educational purposes.

I hypothesized that gender has a moderating effect on the relationship between each of the two predictors (PU and PEU) and the outcome variable (BI) of this study. For this reason, five predictors (PU, PEU, gender, PU × gender, and PEU × gender) were included in multiple linear regression models to assess this hypothesis. This study investigated whether gender moderated the relationship between PU, PEU, and faculty members’ behavioral intention at
KSU. The result of the multiple linear regression model revealed that the complete set of predictors significantly predicted faculty members’ behavioral intention to use mobile learning for educational purposes. However, gender as a moderating variable showed no effect on the relationship between PU and behavioral intention to use mobile learning. These findings aligned with Hu and Lee (2020), Nikolopoulou et al. (2021), Pullen (2015), Teo and Milutinovic (2015), and Wang et al. (2009), who found that PU’s effect on individuals’ behavioral intention was not significantly moderated by gender.

In contrast, the present study’s result showed that gender significantly moderated the relationship between PEU of use and faculty members’ behavioral intention to use mobile learning for educational purposes. The behavioral intention to use mobile learning for educational purposes was stronger for males than females among faculty members at KSU. The slight variation in PEU and behavioral intention was due to two reasons. First, in the current study the number of male participants ($n = 113$) was higher than the number of female participants ($n = 83$). Second, male faculty members cannot interact face-to-face with female students. Since there is a lack of empirical studies related to gender differences between male and female faculty members, it can be only speculated that some faculty members viewed mobile learning as a useful way to work within the religious and cultural restrictions in Saudi Arabia. In fact, due to cultural constraints male faculty members cannot meet with female students in-person. These findings are partially consistent with previous research conducted by Hu et al. (2020), Hur et al. (2014), Kang (2014), and Sharma and Srivastava (2020), who all found that gender had a moderating effect on the relationship between PEU and behavioral intention. Hu et al. (2020) conducted a study in China to examine faculty members’ behavioral intention toward using mobile learning in higher education environments. According to their findings, gender had
a statistically significant moderating effect on the relationship between PEU and behavioral intentions to use mobile learning for educational purposes. The behavioral intention was lower for females than males among faculty members in Chinese higher education. Accordingly, one implication of the current study findings for decision-makers and instructional technology designers is to create different training programs that show how mobile learning is a useful tool for male and female faculty members following the restrictions of Saudi higher education. Also, the finding of the current study partially resonated with Alfrani’s (2014), which found that the length of teaching experience was one of the negative factors that influenced female faculty’s intentions to use mobile learning (Alfrani, 2014). Therefore, the factors that affected female faculty’s behavioral intentions to use mobile learning should be examined.

Some previous studies have contradicted this finding (e.g., Nikolopoulou et al., 2021; Pullen et al., 2015; Teo & Milutinovic, 2015; Wang et al., 2009) in that they determined that gender has no moderating effects on the relationship between PEU and behavioral intention. For example, Nikolopoulou et al. (2021) investigated the moderating effect of gender on instructors’ intentions to use mobile learning for educational purposes in Greece. That study revealed that gender did not moderate the effect of the relationship between perceived ease of use and behavioral intention to use mobile learning. The outcomes of the current study may be consistent or inconsistent with prior studies due to the study’s region, participants’ cultural background (e.g., there is not social interaction between male and female through synchronous learning session), sampling methods, types of research, or sample size. For this reason, to validate that the PEU of the TAM construct has an effect on individuals’ behavioral intention to use mobile learning, it is highly recommended that future investigations examine the same variables at different higher education institutions with many faculty members and consider demographic
factors, such as the location of universities (rural or urban), to generalize the findings. Additionally, using different research methods, such as mixed methods, is recommended to explore this phenomenon in depth and specify what types of skills need to be acquired by faculty members to increase their confidence and enhance mobile learning adoption among them.

Research Question 3

To what extent does age moderate the relationships between 1) faculty members’ perceived usefulness of mobile learning and their behavioral intention to use mobile learning for educational purposes, and 2) faculty members’ perceived ease of use of mobile learning and their intention to use mobile learning for educational purposes?

H: Age moderates the relationships between perceived usefulness and faculty members’ behavioral intention to use mobile learning for educational purposes.

H: Age moderates the relationships between perceived ease of use and faculty members’ behavioral intention to use mobile learning for educational purposes.

The present study hypothesized that age has a moderating effect on the relationship between two predictors (PU and PEU) and this study’s outcome variable (BI). Consequently, five predictors (perceived usefulness, perceived ease of use, age, perceived usefulness × age, and perceived ease of use × age) were included in the multiple linear regression models to assess these hypotheses. This study research mainly investigated whether age moderated the relationship between perceived usefulness, perceived ease of use, and faculty members’ behavioral intention to use mobile learning for teaching purposes at King Saud University in Riyadh, Saudi Arabia. According to the outcomes of the current study, the results from multiple linear regression revealed that the complete set of predictors significantly predicted faculty
members’ behavioral intention to use mobile learning for educational purposes. However, when moderating effects of age were examined, no statistically significant moderating effects were detected on the relationship between perceived usefulness and the outcome variable (faculty members’ behavioral intention). This indicates that younger and older faculty members at KSU do not differ in how perceived usefulness is related to using mobile learning for educational purposes. The results from the current study are consistent with previous research studies conducted by Hu (2019), Hu et al. (2020), Kang (2014), Pullen et al. (2015), Nikolopoulou et al. (2021), and Teo and Milutinovic (2015) who found that age had no moderating effect on the relationship between perceived usefulness and users’ behavioral intention.

Similarly, the present study’s result showed no statistically significant moderating effect of age on the relationship between perceived ease of use and faculty members’ behavioral intention to use mobile learning for educational purposes. The present study’s findings corroborate previous results discussed in several prior studies (Kang, 2014; Pullen et al., 2015; Nikolopoulou et al., 2021; Teo & Milutinovic, 2015). For instance, Teo and Milutinovic (2015) examined the moderating effect of age on instructors adopting new technology tools for educational purposes in higher education settings in Serbia. The study’s results revealed that age did not moderate the relationship between perceived ease of use and users’ behavioral intention to use new technologies for both male and female participants. Due to the high demand by the Ministry of Education to use different technology tools for educational purposes in Saudi Arabia, all faculty members are more willing intend to use technology tools to deliver the learning content and communicate with learners.

In contrast, other studies have observed statistically significant moderating effects of age on the relationship between perceived ease of use and faculty members’ behavioral intention. For
this reason, the present study’s findings contradict results discussed in several prior studies (Hu, 2019; Hu et al., 2020; Hur et al., 2014; Sharma & Srivastava, 2020; Wang et al., 2009; Yu, 2012). For example, Sharma and Srivastava (2020) conducted a study to examine the moderating effects of age on the relationship between PEU and BI among instructors employed at the Management Institutes in India. Their results showed that age had a moderating effect on the relationship between PEO and BI. In their study, the relationship between PEO and BI was stronger for instructors aged between 30 to 40 years.

The findings of this study might be inconsistent with previous studies due to variation in sampling techniques, types of research conducted, sample size, variables included, and participants’ cultural backgrounds. For instance, the sample was limited only to one university (KSU) and the overwhelming majority of faculty members were Saudi citizens. For this reason, it is recommended that future research studies to use different research methods such as mixed methods design to more deeply examine the moderating effects of both gender and age on the relationship between the two TAM constructs and faculty members’ behavioral intention to use mobile learning for educational purposes. Also, future research is suggested to increase the study's population by including all regions of Saudi Arabia to help generalize the findings across the country.

Limitations of the Study

All research has the possibility of establishing limitations that could be related to different aspects such as the literature, research methodology, research instrument, participant responses, data collection, data analysis, and the sample population. The limitations of the current study follow.
This study was limited solely to faculty members at King Saud University, Riyadh, Saudi Arabia. For this reason, the study’s findings do not necessarily generalize to other faculty members working at different universities. Second, few studies have been conducted to examine the effect of age and gender as moderators of the relationships between both perceived usefulness and perceived ease of use and faculty members’ behavioral intention to use mobile learning tools for educational purposes.

A third limitation involved the back-translation of the original survey items into Arabic. The original survey items were translated into Arabic was because that was the first language of most faculty members at KSU. Even though the Arabic version of the survey was sent to an expert in the field of instructional technology who speaks both English and Arabic to check its consistency, a few participants contacted me through email to clarify some survey questions. Finally, although the sample size provided for sufficiently powered analyses (e.g., power of detecting effects of individual predictors exceeding .99 assuming a moderate effect size in the population), additional studies using other samples will help to provide evidence that either verifies or refutes the current findings.

Implications

This study investigated the behavioral intention to use mobile learning among faculty members at King Saud University to improve their competencies related to their teaching tasks. It provided essential findings related to the moderating effect of gender and age on the relationship between PU, PEU, and faculty members’ behavioral intention to use mobile learning for educational purposes. This study’s implications could benefit policymakers, decision makers, instructional designers at universities and institutions aiming to implement mobile learning tools
for their faculty members. The outcomes of this study provide suggestions for further research in the field of educational technology.

One of the important findings of the current study was that PU predicted KSU faculty members’ behavioral intention to use mobile learning for educational purposes. PU is defined in the current study as the degree to which faculty members at KSU believe that using mobile learning for educational purposes will enhance their performance in the teaching process. The current study outcomes reported that PU as an essential aspect among KSU faculty members PU when they intent to use mobile learning tools for education purposes. To take advantage of this findings, faculty need training on how ML supports more effective teaching and enhance students' engagement. Faculty members will be able to learn the benefits of ML to their student's learning and the organization of their teaching. Also, to increase faculty members’ behavioral intention to use mobile learning for educational purposes, specifically at KSU, instructional technology practitioners and decision-makers in Saudi universities should provide a learning management system (LMS) that is usable, compatible with different mobile devices, and beneficial for faculty members to accomplish various tasks. Thus, faculty members will be encouraged to use mobile learning for educational purposes, especially in Saudi higher education settings.

This study found PEU to be a significant predictor of faculty members’ behavioral intention to use mobile learning for educational purposes. PEU was defined as “the degree to which an individual believes that using a particular system would be free of effort” (Davis, 1989, p. 26). PEU, as a construct, focuses on the interface design and the ease of use of a technology tool. The usability of a technology tool determines how individuals interact with that tool. The current study’s outcomes revealed that faculty members perceived mobile learning devices as
easy technology tools for teaching and interacting purposes. These findings agreed with previous research by Schlag and Imhof (2017), Schlag and Imhof (2017), Sharma and Srivastava (2020), and Teeroovengadum et al. (2017). Therefore, instructional technology designers and web and app developers at King Saud University should design professional training programs using the project-based learning approach (PBL) to provide faculty members with a chance to practice how mobile learning is beneficial for them and their students (e.g., self-regulated learning and collaboration with peers). To improve the usability and ease of use of ML, IT designers are recommended to use collect usage data, e.g., questionnaires, eye tracking, interview, etc., to support the revision of mobile learning systems, such as measurement of time completion on a given task, which will result to improve faculty members' performance when using ML in higher education settings. Also, decision-makers should keep in mind the importance of providing differentiated technical support based on gender differences and faculty needs and high-speed wireless internet to ensure faculty members can access the network easily when they use mobile devices for educational purposes.

The significance of gender and age as moderating variables is still a debated issue among researchers in instructional technology. Based on previous literature, gender as a moderating variable did not affect the relationship between either PU or PEU and users’ intentions to adopt new technology (Hu et al., 2020; Nikolopoulou et al., 2021; Pullen et al., 2015; Teo & Milutinovic, 2015; Wang et al., 2009). However, the current study determined that gender moderates the relationship between PEU and behavioral intention to use mobile learning among KSU faculty members for educational purposes. Saudi social norms in terms of gender might strongly influence faculty members’ intentions to accept and use mobile devices in their academic setting because this study found that female faculty’s intention was less than male
faculty. For this reason, University administrators should make an effort to better understand the social influences on user acceptance of technology. In addition, understanding the interaction of social and cultural differences with mobile learning technology is essential for designing and developing ways to successfully integrate it, broaden its user base, and increase its acceptance. Also, decision-makers, web developers, and instructional technology designers, specifically at KSU, should examine how males and females adopt and interact with technology tools, such as mobile devices, to encourage wider acceptance of the new technology. For instance, different training programs would be beneficial in using mobile learning as a tool for male and female faculty members to overcome some of the cultural restrictions of Saudi higher education. On the contrary, the current study found no moderating effect of age on the relationships between PEU and KSU faculty members’ behavioral intention to use mobile learning for educational purposes. The study suggests that KSU faculty members must be treated equally when it comes to adopting mobile learning for educational purposes in the higher education environment, regardless of their age range.

Suggestions for Future Research

This study provides four recommendations for future research. First, this quantitative study showed how PU and PEU are positively related to faculty members’ behavioral intentions to use mobile learning for educational purposes. It is recommended that future studies conduct a qualitative or mixed-methods study to explore in-depth what other factors might influence faculty members’ intentions to use mobile learning for educational purposes.

This study examined the impact of PEU and PU as predictors of faculty members’ behavioral intentions to use mobile learning for educational purposes. Consequently, it is
suggested that future studies employ the Unified Theory of Acceptance and Use of Technology (UTAUT) instead of TAM to examine PU and PEU and include other predictor variables, such as social influence and facilitating conditions, to investigate how these variables might influence faculty members’ behavioral intentions to use mobile learning.

This study examined age and gender as moderator variables. It is recommended that future studies include other variables, such as educational level, years of experience, major field of study, and nationality, to investigate potential moderating effects on the relationship between both PU and PEU and faculty members’ behavioral intention to use mobile learning for educational purposes.

This study was conducted at King Saud University, Riyadh, Saudi Arabia; future studies are recommended that replicate the study by expanding the study population, such as including all faculty members who work in public or private universities in Saudi Arabia, to examine their behavioral intention to use mobile learning for educational purposes. This replication will help to provide finding that more broadly represent faculty members in Saudi Arabia, which will help to generalize the findings across the country.

Chapter Summary

This study was designed to examine how PU and PEU predict faculty members’ behavioral intention to use mobile learning for educational purposes. It also examined gender and age as potential moderators of the relationship between both PU and PEU and faculty members’ behavioral intention. The present study applied the TAM as the theoretical framework, which aims to examine users’ behavioral intentions to use new technology. The constructs of PU
and PEU were used to predict faculty members’ behavioral intention to use mobile learning for educational purposes.

Major findings revealed that PU and PEU each had a significant, positive relationship with faculty members’ behavioral intention to use mobile learning for teaching purposes. This study examined the moderating effects of gender and age on the relationship between both PU and PEU and users’ behavioral intentions. Interestingly, the results revealed that the relationship between PEU and faculty members’ behavioral intention to use mobile learning for educational purposes was stronger for males than females. However, the findings showed that the impact of PU and PEU on behavioral intention to use mobile learning was not significantly moderated by age. Finally, the study’s limitations; implications for decision-makers, technology designers, and practitioners in higher learning settings; and suggestions for future research were provided.
REFERENCES


APPENDIX A

POWER ANALYSIS
G*Power Outcome

Critical $F = 2.6835$

**Test family**
- F tests

**Statistical test**
- Linear multiple regression: Fixed model, $R^2$ increase

**Type of power analysis**
- A priori: Compute required sample size – given $\alpha$, power, and effect size

**Input parameters**
- Determine: Effect size $f^2$ = 0.15
- $\alpha$ err prob = 0.05
- Power (1- $\beta$ err prob) = 0.95
- Number of tested predictors = 3
- Total number of predictors = 3

**Output parameters**
- Noncentrality parameter $\lambda$ = 17.8500000
- Critical $F$ = 2.6834991
- Numerator df = 3
- Denominator df = 115
- Total sample size = 119
- Actual power = 0.9509602
APPENDIX B

FRED DAVIS’S PERMISSION
Dear Ibrahim
You have my permission to use and adapt the scale items of my TAM instrument for your research.
Best wishes
Fred Davis

Thank you!  Thank you so much!  Thanks a lot!

Are the suggestions above helpful?  Yes  No
APPENDIX C

MODIFIED TAM INSTRUMENT
- What is your gender?
  - Female
  - Male
  - Other

- What is your Age?
  - 20 - 30 years
  - 31 - 40 years
  - 41 - 50 years
  - 51 - 60 years
  - More than 60 years

- What college do you belong for:
  - Science Colleges
  - Community Colleges
  - Health Colleges
  - Humanities Colleges
  - Other:

- What is your academic rank level?
  - Teaching Assistant
  - Lecturer
  - Assistant Professor
  - Associate Professor
  - Professor
- Specify your year of teaching experience
  o 1 - 5
  o 6 - 10
  o 11 - 15
  o 16 - 20
  o 21 or more years

- How satisfied are you with your current skills for using mobile devices?
  o Very satisfied
  o Satisfied
  o Neither satisfied nor dissatisfied
  o Dissatisfied
  o Very dissatisfied
Please use the prescribed scale of 1 - 5 with 1 being “strongly disagree” and 5 being “strongly agree” to indicate your level of agreement about using Mobile learning as a tool for educational purposes.

Items adapted from Davis (1989)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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</thead>
<tbody>
<tr>
<td><strong>Construct: Perceived Usefulness</strong></td>
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<td>2. Using Mobile Learning saves my time.</td>
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<td>3. Using Mobile Learning enables me to accomplish teaching tasks more quickly.</td>
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<td>4. Using Mobile Learning enhances my effectiveness on the teaching.</td>
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<td>5. Using Mobile learning increases my productivity.</td>
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<td>6. Using Mobile learning as a tool improves the quality of the work I do.</td>
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<td>7. Overall, I find Mobile Learning useful as a teaching tool is in my workplace.</td>
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<td><strong>Construct: Perceived Ease of Use</strong></td>
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<td>8. Learning to use Mobile Learning as a tool is easy for me.</td>
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<td>9. It is easy for me to become proficient in using Mobile Learning as a tool for educational purposes.</td>
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<td>10. My interaction with Mobile Learning as a tool is easy for me to understand.</td>
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<td>11. It would be easy for me to become skillful at using Mobile Learning as a tool.</td>
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<td>12. Overall, I find Mobile Learning as a tool easy to use.</td>
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<td><strong>Construct: Intention to Use Mobile Learning</strong></td>
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<td>13. I intend to use Mobile Learning as a tool for educational purposes.</td>
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<td>14. I intend to use Mobile Learning as a tool frequently for all teaching purposes.</td>
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<td>15. I am proud about using the Mobile Learning as a tool for educational purposes.</td>
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<td>16. Overall, I intend to use Mobile Learning as a tool for teaching purposes in the future.</td>
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APPENDIX D

IRB APPROVAL
Exempt Determination

29-May-2020
Ibrahim Albahli (Z1754872)
Educational Technology, Research and Assessment

RE: Protocol # HS20-0362 "Investigating determinants of faculty members' intentions to use mobile learning for educational purposes"

Dear Ibrahim Albahli,

Your application for institutional review of research involving human subjects was reviewed by the Office of Research Compliance, Integrity, and Safety on 29-May-2020 and it was determined that it meets the criteria for exemption 2.

Although this research is exempt, you have responsibilities for the ethical conduct of the research and must comply with the following:

Amendments: You are responsible for reporting any amendments or changes to your research protocol that may affect the determination of exemption and/or the specific category. This may result in your research no longer being eligible for the exemption that has been granted.

Record Keeping: You are responsible for maintaining a copy of all research related records in a secure location, in the event future verification is necessary. At a minimum these documents include: the research protocol, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to participants, all correspondence to or from the IRB, and any other pertinent documents.

Please include the protocol number (HS20-0362) on any documents or correspondence sent to the IRB about this study.

If you have questions or need additional information, please contact the Office of Research Compliance, Integrity, and Safety at 815-753-8588.
APPENDIX E

CONSENT FORM
I agree to participate in the research project titled “Investigating Determinants of Faculty Members’ Intentions to Use Mobile Learning for Educational Purposes” being conducted by Ibrahim Albahli, a doctoral student at Northern Illinois University.

I have been informed that there are no potential risks and/or discomforts I could experience during this study. I understand that all information gathered during this experiment will be kept anonymous (your name will not be shown in the survey).

I have been informed that the purpose of the study is to investigate how the attitudinal factors (perceived usefulness and perceived ease of use) predict faculty members’ behavioral intention at King Saud University, Saudi Arabia, to use mobile learning tools, such as (laptops, tablets, smartphones) for educational purposes based on the Technology Acceptance Model (TAM).

I understand that if I agree to participate in this study, I will be asked to complete all question items listed in the questionnaires. I am aware that my participation is voluntary and may be withdrawn at any time without penalty or prejudice, and that if I have any additional questions concerning this study, I may contact (Ibrahim Albahli at +1(815) 517-4947 or email address: Z1754872@students.niu.edu

I understand that if I wish further information regarding my rights as a research subject, I may contact the Office of Research Compliance at Northern Illinois University at (815) 753- 9339. I understand that the intended benefits of this study include gaining data about faculty members intentions toward implementation of mobile learning in higher education settings.
I realize that Northern Illinois University policy does not provide for compensation for, nor does the University carry insurance to cover injury or illness incurred as a result of participation in University sponsored research projects. I understand that the timespan required to answer all the questions listed in the survey is between (3) to (5) minutes.

I understand that my consent to participate in this project does not constitute a waiver of any legal rights or redress I might have as a result of my participation, and I acknowledge that I have received a copy of this consent form.

I understand that, by clicking the “I agree” button below, I am providing my informed consent to participate in this study.