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Women Entrepreneurs' Adoption of Mobile Applications for Business Sustainability

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Abstract: Business sustainability is a major goal for every entrepreneur, especially women entrepreneurs. The term "business sustainability" refers to efforts that help a company's long-term growth and competitive edge over its competitors. This study sought to empirically examine the adoption of mobile applications by women entrepreneurs as a means of business sustainability. Using the UTAUT as a theoretical model, this research examined this model and its associated hypotheses by applying structural equation modelling. The survey results from 330 women entrepreneurs in Saudi Arabia show that social influence, followed by effort expectancy, has the most significant influence on the behavioural intention to use mobile applications. On the other hand, facilitating conditions were found to be an insignificant predictor of the behavioural intention of women entrepreneurs in Saudi Arabia to use mobile applications.

Keywords: mobile; applications; adoption; women; entrepreneurs; sustainability

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1. Introduction

Increased access to information and communications technology (ICT) has been defined as a key sustainable development goal target by the United Nations (UN), with a deadline set for 2020 [1]. Recently, the concept of a sustainable information society has become popular. This concept refers to the use of ICT as a main enabler of long-term sustainability in companies [2–4]. Therefore, the use of modern technologies is an important driver behind the sustainability of many of today's businesses [5]. These technologies empower businesses to compete with their competitors and improve their products and services in the same marketspace [6].

Sustainability in entrepreneurship, which plays an essential role in most economies and represents a vital sector of businesses, is a key contributor to global economic growth [7]. This is because such businesses are creative, adaptable, and profitable [8]. Accordingly, sustainability is among the main issues faced by these businesses [9]. In the 21st century, the adoption of technology has become vital for entrepreneurs seeking to maintain their sustainability. Businesses that do not adopt new and novel technologies are not expected to last. Furthermore, the concept of sustainable entrepreneurs suggests "any activity that promotes the sustained growth and advantage relative to competitors [10]". Additionally, entrepreneurial business strategies for business development in a competitive environment are related to innovative sustainability methods [11–15].

Technology adoption facilitates business sustainability as it changes the state of both economic and social life by altering the way that people live, work, and conduct business. In this sense, Refs. [16,17] state that most entrepreneurs have adopted technology and have moved away from traditional entrepreneurial structures. This is evident in the United States in cases such as Amazon, Google, Facebook, and WhatsApp. If technology is used properly, it can provide effective tools to support sustainable entrepreneurship with the potential for empowering women entrepreneurs both economically and socially [14]. In fact, female entrepreneurs play a significant role in the economic development of any

nation [18–21]. Their role is critical in terms of generating income, creating jobs, and reducing poverty [22].

Entrepreneurs are changing their methods for obtaining market information due to the rapid adoption of mobile smart phones, as well as the development of mobile apps [23]. Recently, mobile phones have become useful for finding market information, such as comparing prices, locating possible customers, and determining the best distribution channel for different products [24]. This represents an important advantage, particularly for women entrepreneurs, when it comes to the decisions associated with their products and services [25]. The acceptance of mobile applications can help female entrepreneurs increase their revenue, grow consumer loyalty, increase business networks, improve publicity, and market their products to a wider audience [26].

Mobile application adoption is suitable for women entrepreneurs in Saudi Arabia, as it is not costly, has low technical requirements, and is easy to participate in. Mobile applications provide women entrepreneurs with the ability to research, market, and develop their brand, as well as reach different market niches [27]. Mobile applications are an easy and cost-effective solution for women entrepreneurs when it comes to the creation of wide business networks, reaching prospective customers, and listening to their customers' voices. This is in addition to managing their reputation, gathering marketing data, and establishing customer trust [28]. Currently, many women entrepreneurs believe that they must use mobile applications for their businesses to be sustainable [21]. Therefore, mobile application acceptance is the main enabler of sustainability for many companies [10]. Accordingly, the adoption of mobile applications in startup business models is a key factor in the sustainability and performance of small businesses [8].

Several efforts have been made to analyse the adoption of technology by women entrepreneurs. For example, Ref. [22] examined how the human competencies of women business owners in South Africa align with mobile phone adoption, while Ref. [17] explored mobile technology adoption by women entrepreneurs in Tanzania. Additionally, Ref. [18] investigated technology adoption by rural women entrepreneurs in India, and Ref. [19] examined the use of digital technology strategies for the promotion of female entrepreneurs in the UAE. Furthermore, Ref. [27] explored the aspects that influence mobile services' behavioural intentions among female entrepreneurs in Fiji, whereas Ref. [28] examined the adoption of technology and open innovations among women entrepreneurs in relation to sustainability in Bangladesh. However, according to a comprehensive review of the available literature, minimal theory-based empirical research has been conducted on mobile application adoption by women entrepreneurs in Saudi Arabia. As there is significant interest in this subject, it is worth exploring further. The current study empirically examines the adoption of mobile applications by women entrepreneurs as a means of business sustainability.

After establishing the study's justification and purpose, the remains of the article are organized as follows: the next section contain a literature review that is divided in to two sections; technology adoption by women entrepreneurs, and technology adoption and entrepreneurship sustainability. A review of the unified theory of acceptance and use of technology (UTAUT), and the development of its hypothesis, is offered in the third section. After that, the methodology and data collection are presented in the fourth section. The results are offered in the fifth section. The discussion is presented in Section six. The seventh and final section presents the conclusion.

2. Literature Review

2.1. Technology Adoption by Women Entrepreneurs

Only a few studies have explored the adoption of technology by women entrepreneurs in relation to sustainability. To wit, Ref. [29] analysed mobile money service adoption by women entrepreneurs in Kenya. The outcomes suggest that women's decision making around, and control of, their enterprise finances affect the use of mobile money technologies significantly. Moreover, Ref. [19] examined the challenges related to technology

implications regarding the strategic business decisions of women in South Africa. By implementing a qualitative study approach, the findings confirm a limited established scholarship on technopreneurship in South Africa. Additionally, Ref. [20] used a qualitative research methodology and conducted 20 interviews with women-run startups in the United Arab Emirates. The results showed that all of the interviewed women were using chat applications as well as social media to promote their business, specifically Facebook and WhatsApp. Digital tool adoption was the first priority in these women's business promotions.

In this sense, Ref. [16] empirically examined the effects of women entrepreneurs' perceived expertise and personal innovativeness in relation to digital marketing adoption intentions. Using TAM with additional constructs, as well as a survey questionnaire directed at the women entrepreneurs of micro and small enterprises, the data were collected and analysed using regression analysis. Besides, Ref. [30] examined the influence of ICT adoption by households on enabling long-term sustainability. By collecting data from 679 Polish households using a survey questionnaire, the findings show that ICT management, information culture, and ICT quality have a significant influence on sustainability. Furthermore, Ref. [17] explored the needs of women entrepreneurs when adopting mobile technologies for the purpose of accessing market-related information in Tanzania. The outcomes show that product usefulness, personal contact, as well as price information are the main elements related to mobile technology acceptance by women entrepreneurs in Tanzania. Additionally, Ref. [31] examined the behavioural intention to use Facebook live by women entrepreneurs for marketing in Bangladesh. By extending the TAM model, this study explored the influence of perceived usefulness, perceived ease of use, compatibility, consumer relationship, brand awareness, and intention. The research collected 283 online surveys from women entrepreneurs with an online store on Facebook. The results showed that social media marketing was affected by compatibility, usefulness, and ease of use.

In this context, Ref. [18] highlighted that the various types of access such as materials, skill, mental, and usage significantly affected ICT adoption by rural women in India. The findings of this study connected technology adoption with women micro-entrepreneurs. Furthermore, Ref. [22] examined mobile phone adoption among women entrepreneurs in South Africa. The researchers collected data from 70 women entrepreneurs and analysed it using cluster analysis. In this vein, Ref. [24] explored the adoption of mobile applications by women entrepreneurs in Tanzania to access market information and improve their business performance and quality of living. Likewise, Ref. [27] investigated the acceptance of mobile services by women micro-entrepreneurs in Fiji. This study examined the perceived usefulness, perceived ease of use, and social influence on behavioural intentions to use mobile value-added services. The researchers surveyed 74 women micro-entrepreneurs and found that social influence was the main driver of their intention to adopt a new technology. Additionally, Ref. [32] investigated digital business acceptance use by female entrepreneurs using two case studies of SMEs in Italy, while Ref. [33] explored the factors that affected ICT adoption by women entrepreneur-owned SMEs in Bangladesh.

While reviewing the technology adoption by women entrepreneurs' research Ref. [34] explored the acceptance of digital financial services by female micro-entrepreneurs in Pakistan. Using a qualitative approach to study 20 women micro-entrepreneurs, the researchers explored how technology influenced the women's business, showing how mobile money was not adjusted to solve the difficulties that they faced in terms of their financial needs. Likewise, Ref. [35] explored the role of smartphones in increasing entrepreneurial opportunities for women in Asia. The survey was conducted involving 265 women entrepreneurs in several regions in Asia and structural equation modelling was used for the analysis. Furthermore, Ref. [26] examined the adoption of mobile phone services by women entrepreneurs in Kenya. Data were collected from 350 questionnaires and in-depth interviews. The results indicate that women entrepreneurs in Kenya only use the basic functions of mobile phones. In relation to this, Ref. [36] examined the impact of digitalisation on women-owned startups in India. The results demonstrate that women-owned startups

were driven by digitisation and technology adoption in their businesses. In addition to this, Ref. [23] conducted a comparative study to analyse mobile phone adoption among women entrepreneurs in Uganda and Kenya.

In the same review, Ref. [37] A modified UTAUT2 was used to examine e-commerce intention and use by women entrepreneurs in India. Similarly, Ref. [21] used a case study to investigate the use of mobile technologies by women entrepreneurs in Uganda, while Ref. [38] examined the acceptance of mobile value-added services for comprehensive growth by interviewing 74 women entrepreneurs in Fiji. Conversely, Ref. [39] explored how digital technology was utilised by women entrepreneurs to establish new opportunities. Using a qualitative approach, they interviewed 17 women-owned businesses in Australia. The results indicated that technology created opportunities for women business owners to overcome multiple difficulties. Additionally, Ref. [40] investigated ICT adoption by female entrepreneurs in their business firms. This was in addition to exploring the barriers in relation to the adoption of ICT applications by women entrepreneurs in India. Furthermore, Ref. [41] explored the use of WhatsApp for e-commerce by women entrepreneurs, with special reference to women's clothing and accessories. This was conducted using the qualitative method of in-depth interviews with 10 women over WhatsApp, along with a focus group discussion. On the other hand, Ref. [42] examined the adoption of ICT by women micro-entrepreneurs in India, and Ref. [7] empirically examined the ICT opportunities for women by examining 32 women entrepreneurs. The literature also shows that [25] examined mobile application adoption by female entrepreneurs in India. In Addition, Ref. [28] examined the impact of technology adaption and open innovations on women entrepreneurs and the challenges that they face when implementing open innovations in Bangladesh. Furthermore, Ref. [43] examined 253 responses from women entrepreneurs' regarding their adoption of social media platforms. The results indicate that financial challenges moderated the relationship between the perception of women entrepreneurs' perception and social media implementation. Accordingly, only a single study has been conducted in Saudi Arabia, and it examined social media adoption by women entrepreneurs rather than the adoption of mobile applications. Additionally, the study was not theory based. Therefore, the current study aims to apply a theory to examine the adoption of mobile applications by women entrepreneurs as a means of business sustainability.

2.2. Technology Adoption and Entrepreneurship Sustainability

In relation to the literature on technology adoption and entrepreneurship sustainability, [10] examined ICT acceptance for sustainable development in SMEs in the USA and China using a grounded theory to conduct interviews. The study found that ICT was more accepted in the USA than in China, as more small businesses in the USA understand the usefulness of technology for business sustainability. Similarly, Ref. [44] investigated ICT entrepreneurship innovation in relation to sustainability. The researchers found that ICT entrepreneurship plays a significant role in national economic growth. However, Ref. [45] observed the influence of ICT acceptance and sustainable entrepreneurial growth in Western Africa. Data were collected using econometric tools. The findings showed that ICT adoption has a positive and statistically significant effect on sustainability in entrepreneurship. Similarly, Ref. [10] identified the key factors that impacted the success and failure of information technology services. The researchers surveyed 11 IT experienced entrepreneurs, and conducted a *t*-test analysis as well as a logistic regression analysis. The results presented 141 success factors and 101 failure factors. Likewise, Ref. [13] investigated factors affecting the intention to adopt cryptocurrency payments by small SMEs in tourism by examining TAM. Using a sample of 101 SMEs with a total of 15,831 respondents in Taiwan, the results from the structural equation modelling show that strategic orientation, owner/managers characteristics, and social influence have a significant effect on intention to adopt new technology.

Ref. [15] conducted a systemic literature review to explore SME sustainability by identifying the challenges related to SME performance. This was conducted by identifying

the acceptance of new technological advances relates to the survival of small businesses in terms of global competition. Furthermore, Ref. [12] examined the relationships between institutional pressures, e-business entrepreneurship, actual usage, as well as the sustainability of the business. The researchers collected data from 41 companies with 328 respondents using a questionnaire survey. The results show a significant effect of institutional pressures on e-business entrepreneurship, a direct relationship between e-business entrepreneurship and actual usage, all of which have a direct influence on long-term sustainability. Finally, Ref. [14] examined the relationship between entrepreneurial framework conditions and business sustainability among women entrepreneurs using institutional theory. Data were collected from 390 women entrepreneurs in Uganda. The results show that finance and IT infrastructure have an important influence on business sustainability among women entrepreneurs. However, according to a comprehensive review of the available literature, limited theory-based empirical research has been conducted on mobile application adoption by women entrepreneurs especially in Saudi Arabia.

3. Theoretical Background

In terms of theory, [6] developed the UTAUT through integrating eight user acceptance theories. The theories include the theory of planned behaviour, the theory of reasoned action, the motivational model, the technology acceptance model (TAM), the combined theory of planned behaviour and technology acceptance model, the model of personal computer utilisation, social cognitive theory, and the diffusion of innovation theory. The UTAUT proposes that there are four core constructs of acceptance, including performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy is defined as "the degree to which an individual believes that using the system will help a person to attain gains in job performance" ([6] p. 447). Effort expectancy is defined as "the degree of ease associated with the use of the system" ([6] p. 450). Social influence is defined as "The extent to which an individual perceives that important other believe he or she should use the new system" ([6] p. 451). Facilitating conditions are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system." ([6] p. 453). In this sense, [6] has indicated that these four factors are the main determining constructs of behavioural intention and are related to the role of behaviour in technology acceptance. According to the UTAUT, the four main constructs are moderated by four factors, including gender, age, experience, and voluntariness.

UTAUT describes up to 70% of the differences in behavioural intentions. This is more than the six former theories and models, the maximum explanation of which was about 40% [6]. As such, [6] recommends that further research should re-validate the proposed scales and examine each construct to investigate different kinds of technologies and/or to expand UTAUT to incorporate other measures. This research therefore suggests that exploring the UTAUT in the context of mobile application adoption is useful. Accordingly, the following hypotheses were formulated:

Hypothesis 1 (H1). *Performance expectancy has a significant and positive effect on the behavioural intention to use mobile applications by women entrepreneurs.*

Hypothesis 2 (H2). *Effort expectancy has a significant and positive effect on the behavioural intention to use mobile applications by women entrepreneurs.*

Hypothesis 3 (H3). *Social influence has a significant and positive effect on the behavioural intention to use mobile applications by women entrepreneurs.*

Hypothesis 4 (H4). *Facilitating conditions has a significant and positive effect on the behavioural intention to use mobile applications by women entrepreneurs.*

TAM suggests that perceived ease of use has a positive and significant effect on the perceived usefulness of a given technology [46]. Based on the UTAUT, performance expectancy consists of perceived usefulness while effort expectancy consists of perceived ease of use. Several researchers have indicated that perceived ease of use is a direct predictor of perceived usefulness in relation to the adoption of mobile applications by women entrepreneurs [31,38,46]. Accordingly, the following hypothesis was formulated:

Hypothesis 5 (H5). *Effort expectancy has a significant and positive effect on performance expectancy regarding the use of mobile applications by women entrepreneurs.*

4. Methodology and Data Collection

This study used questionnaire items to measure the UTAUT variables adapted from [6]. The scale items are presented in Table 1.

Table 1. Scale items of the selected constructs.

Constructs	Measuring Items	Validation of the Items
Performance Expectancy (PE)	PE1: I would find mobile applications useful in my daily life. PE2: Using mobile applications enables me to accomplish tasks more quickly. PE3: Using mobile applications increases my productivity.	[6]
Effort Expectancy (EE)	EE1: My interaction with mobile applications would be clear and understandable. EE2: It would be easy for me to become skilful at using mobile applications. EE3: I would find mobile applications easy to use. EE4: Learning how to use mobile applications is easy for me.	[6]
Social Influence (SI)	SI1: People who influence my behaviour think that I should use mobile applications. SI2: People who are important to me think I should use mobile applications. SI3: In general, people whose opinion I value have supported the use of mobile applications.	[6]
Facilitating Conditions (FC)	FC1: I have the resources necessary to use mobile applications. FC2: I have the knowledge necessary to use mobile applications. FC3: Mobile applications are not compatible with other systems I use. FC4: I can get help from others when I have difficulties using mobile applications.	[6]
Behavioural Intention (BI)	BI1: I intend to use mobile applications in the future. BI2: I predict I would use mobile applications in the future. BI3: I plan to use mobile applications frequently.	[6]

The present study collected primary as well as secondary data. The secondary data were obtained by reviewing the literature and the theoretical foundations. Furthermore, this study also collected primary data from women entrepreneurs in Saudi Arabia [47]. The researcher decided that quantitative data were the most suitable data type for the present study rather than qualitative. This is due to the focus of this study examining the UTAUT variables including performance expectancy, effort expectancy, social influence, and facilitating conditions, in addition to behavioural intention regarding the use of mobile applications by women entrepreneurs. It was vital to quantify the results by using statistical measures [48]. Furthermore, Ref. [6]'s UTAUT theory provided measurement items to examine the constructs quantitatively. This is suggestive of the fact that quantitative data are the most suitable method for this study.

To estimate the degree of responses, a seven-point scale from 'strongly agree' to 'strongly disagree' was used. Furthermore, a pilot study was utilised using 15 questionnaires circulated to women entrepreneurs in Saudi Arabia to see whether there were any difficulties in terms of understanding and completing the questionnaire [47]. Consequently, the questionnaire was rechecked for clarity and simplicity of the language. The survey was then translated into Arabic to overcome language differences. The current study applied convenience sampling as it is not costly and the results can be generalised due to having a variety of respondents [47]. The questionnaire was circulated through online web links sent to women entrepreneurs using Qualtrics software [48].

For data analysis, structural equation modelling (SEM) is the most recent and reliable method in social science research [47,48]. This approach was therefore selected. SEM provides a systematic mechanism that allows for the checking of the validity of a hypoth-

esis by enabling the examining of the relations between several constructs in one model. Confirmatory factor analysis (CFA) was the method used to examine the measurement model, and a maximum likelihood (ML) assessment technique was utilised in the AMOS software [47,48]. The ML technique is commonly recognised and known in SEM analysis as it improves the parameter estimates by reducing differences among the observed and covariance matrices.

5. Results

Table 2 shows the respondents' characteristics. This research only examined age and education. This is because gender was eliminated because all of the respondents were women. The demographic information of the survey sample indicates that the biggest age group in the sample was those aged 21–29 years old at 65.2%, second are those aged ≥18–20 years old at 22.7%. The remaining percentages were divided between the other age groups. For education level, most of the respondents had graduated from high school, representing 47.3% of the sample, followed by those who held a Bachelor's degree (41.5%). The remaining percentages were divided between the diploma holders and postgraduates. Table 2 presents the demographic information of the respondents from the sample.

Table 2. Respondents' profiles and characteristics.

Variable	Group	Frequency	Percent
Age	≥18–20	75	22.7
	21–29	215	65.2
	30–39	36	10.9
	40–49	3	0.9
	50 and above	1	0.3
	Total	330	100.0
Education	Less than High School	1	0.3
	High School	156	47.3
	Diploma	25	7.6
	Bachelor	137	41.5
	Postgraduate	11	3.3
	Total	330	100.0

Regarding the mobile application experience of the women entrepreneurs in the sample, the largest proportion in the sample had less than one year of mobile application experience (45.2%). The second largest group had 1–2 years of mobile application experience (21.8%), followed by those with 3–5 years of experience (20.3%). Finally, 12.7% of women had more than 5 years of mobile application experience (Table 3).

Table 3. Mobile application experience.

Variable	Group	Frequency	Percent
Mobile applications Experience	Less than 1 year	149	45.2
	1–2 years	72	21.8
	3–5 years	67	20.3
	More than 5 years	42	12.7
	Total	330	100.0

This study used descriptive statistics to measure the constructs' items, means, and standard deviations, as well as normality. This was in order to explain the normal distribution of the metric shape of the constructs [47,48]. Additionally, this study examined skewness and kurtosis. Skewness presents the balance of distribution and kurtosis shows how peaked the distribution is. The most acceptable distribution for kurtosis and skewness

is ±2.58 [47]. The results of this study confirm that skewness and kurtosis fall within a suitable range.

A reliability test examines internal consistency regarding whether the measurement items of the investigated constructs are compatible with each other and determines the freedom of error [47]. Cronbach's alpha is a commonly used measure to examine reliability [47,48]. In the current study, the Cronbach's alpha test results are shown in Table 4. All of the examined constructs fall within the acceptable values, with Cronbach's alpha measures ranging from 0.908 for behavioural intention as the maximum to 0.641, with social influence as the minimum. All of the constructs ranged between excellent, moderate, and good within the acceptable range [47,48]. All of the examined constructs were determined to be appropriate for further analysis (Table 4).

Table 4. Reliability test of the investigated constructs (Cronbach's alpha).

Constructs	Sample	Total Items	Items after Deleting	Cronbach's Alpha	Reliability
Performance Expectancy	330	3	3	0.736	Good
Effort Expectancy	330	4	3 (EE1)	0.705	Good
Social Influence	330	3	3	0.641	Moderate
Facilitating Condition	330	4	3 (FC1)	0.697	Moderate
Behavioural Intention	330	3	3	0.908	Excellent

A common method bias degree was examined by combining all of the tested factors in the principal component factor analysis [47,48]. Common method bias occurs when one item records the maximum of the covariance. Specifically, 50% is the beginning set for the maximum of the variances [47,48]. The value of the tested model had a variance of 37.571%, which was within the 50% acceptable mark. Accordingly, common method bias was not a problem in the current study as no single variable was recorded to have the maximum of the variances (Table 5).

Table 5. Common method bias.

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.260	37.571	37.571	5.260	37.571	37.571
2	1.447	10.334	47.905			
3	1.288	9.197	57.102			
4	1.067	7.625	64.727			
5	0.867	6.190	70.917			

Extraction method: principal component analysis.

5.1. Measurement Model

The measurement model was estimated using maximum likelihood (ML) to examine the model fit in relation to the confirmatory factor analysis provided by AMOS. Table 6 shows the fit indices of the proposed measurement model. The outcomes are in a suitable measure. However, the CFI and NFI are a little lower than the acceptable measures.

The sum of the items was correlated to improve the model fit according to the modification indices recommendations in AMOS. Table 7 presents the fit indices for the final measurement model. The modified model fits within the suitable measures [47,48].

All of the estimates of the examined item loadings were above the range of 0.50. The standard errors were acceptable with less than a ±2.5 value. The critical ratios for all of the examined items exceeded 1.96 [47,48]. Accordingly, the loadings of all items were statistically significant and within the expected path (Table 8).

Table 6. Chi-square results and GOF indices for the measurement model (first run).

	χ^2	df	χ^2/df	GFI	AGFI	CFI	NFI	RMSEA
Criteria			3:1	≥0.9	≥0.8	≥0.95	≥0.9	<0.07
Model GOF	234.431	109	2.151	0.922	0.891	0.943	0.899	0.059

χ^2: chi-square, df: degrees of freedom, χ^2/df: normed chi-square, GFI: goodness-of-fit index, AGFI: adjust goodness-of-fit index, CFI: comparative fit index, NFI: normed fit index, RMSEA: root mean square error of approximation.

Table 7. Chi-square results and GOF indices for the revised measurement models (second run).

	χ^2	df	χ^2/df	GFI	AGFI	CFI	NFI	RMSEA
Criteria			3:1	≥0.9	≥0.8	≥0.95	≥0.9	<0.07
Model GOF	96.334	63	1.529	0.961	0.934	0.981	0.948	0.040

χ^2: chi-square, df: degrees of freedom, χ^2/df: normed chi-square, GFI: goodness-of-fit index, AGFI: adjust goodness-of-fit index, CFI: comparative fit index, NFI: normed fit index, RMSEA: root mean square error of approximation.

Table 8. Item loadings.

		Estimate	S.E.	C.R.	*p*-Value
PE1	Performance Expectancy	0.662			
PE2	Performance Expectancy	0.767	0.118	9.792	***
PE3	Performance Expectancy	0.666	0.122	9.199	***
EE2	Effort Expectancy	0.729			
EE3	Effort Expectancy	0.582	0.100	7.707	***
EE4	Effort Expectancy	0.607	0.118	7.643	***
SI1	Social Influence	0.516			
SI2	Social Influence	0.708			
SI3	Social Influence	0.669	0.103	8.420	***
FC2	Facilitating Condition	0.726			
FC3	Facilitating Condition	0.720	0.111	8.046	***
FC4	Facilitating Condition	0.603	0.096	7.273	***
BI1	Behavioural Intention	0.855			
BI2	Behavioural Intention	0.871	0.053	19.934	***
BI3	Behavioural Intention	0.903	0.054	20.829	***

The results demonstrate that all of the factor loadings exceed 0.5. The lowest value was 0.516. A construct reliability (CR) result of 0.70 or more was considered to be good [47,48]. The construct CR was above 0.70, ranging from 0.725 to 0.909, representing acceptable reliability. A good average variance extracted (AVE) indication begins from the value of 0.5 [47,48]. The results show that the AVE is above 0.5 for all constructs ranging from 0.555 to 0.884 (Table 9).

Discriminant validity occurs when the average variance extracted (AVE) correlations between any two constructs exceed the squared correlation estimates [47]. Table 10 shows the squared pairwise correlation of the AVE to each of the examined constructs. The results demonstrate that the square root of the AVE for all of the observed constructs was more than the correlations with all of the other constructs.

5.2. Structural Model and Hypothesis Testing

The measurement model was transformed into the structural model to examine the relationships among the constructs according to the proposed hypothesis [48]. The results show a satisfactory level of fit. The chi-square (χ^2 = 96.371) with degrees of freedom (df = 64) presented an appropriate normed chi-square (χ^2/df = 1.506), (GFI = 0.961), (AGFI = 0.935), (CFI = 0.981), (NFI = 0.948), and (RMSEA = 0.039). Accordingly, the results of all of the goodness-of-fit indices are within a suitable range of measures (Table 11).

Table 9. Validity assessments.

Items	L	CR	AVE	SQRT (AVE)
Performance Expectancy	2.095	0.742	0.586	0.765
PE1	0.662			
PE2	0.767			
PE3	0.666			
Effort Expectancy	1.918	0.776	0.566	0.782
EE2	0.729			
EE3	0.582			
EE4	0.607			
Social Influence	1.377	0.743	0.561	0.779
SI1	0.516			
SI2	0.708			
SI3	0.669			
Facilitating Condition	2.049	0.725	0.555	0.745
FC2	0.726			
FC3	0.720			
FC4	0.603			
Behavioural Intention	2.629	0.909	0.884	0.940
BI1	0.871			
BI2	0.855			
BI3	0.903			

Note: CR: composite reliability; L: factor loading; AVE: average variance extracted.

Table 10. Squared pairwise correlation.

	PE	EE	SI	FC	BI
PE	**0.765**				
EE	0.380 **	**0.682**			
SI	0.410 **	0.380 **	**0.679**		
FC	0.336 **	0.506 **	0.429 **	**0.745**	
BI	0.419 **	0.467 **	0.465 **	0.425 **	**0.940**

** Correlation is significant at the 0.01 level (2-tailed).

Table 11. Structural model and hypothesis testing.

	χ^2	df	χ^2/df	GFI	AGFI	CFI	NFI	RMSEA
Criteria			3:1	≥0.9	≥0.8	≥0.95	≥0.9	<0.07
Model GOF	96.371	64	1.506	0.961	0.935	0.981	0.948	0.039

χ^2: chi-square, df: degrees of freedom, χ^2/df: normed chi-square, GFI: goodness-of-fit index, AGFI: adjust goodness-of-fit index, CFI: comparative fit index, NFI: normed fit index, RMSEA: root mean square error of approximation.

The hypotheses were examined by evaluating the path estimates using the critical t-value [47,48]. The results of the hypothesis testing indicate that four out of the five tested hypotheses are supported. However, the influence of FC on BI was found to be insignificant. Table 12 presents the hypothesis testing results.

Table 12. Results of the hypothesis testing.

H#	Hypothesis		β	S.E.	C.R.	*p*	Supported
	Independent Variable	Dependent Variable					
H1	PE	BI	0.17	0.112	2.286	0.022	YES
H2	EE	BI	0.36	0.167	2.708	0.007	YES
H3	SI	BI	0.37	0.125	3.755	***	YES
H4	FC	BI	−0.05	0.154	−0.405	0.686	NO
H5	EE	PE	0.55	0.079	5.788	***	YES

*** $p < 0.001$.

Squared multiple correlations (R*) examine the regression line estimates and the data points between zero and one statistically. This shows how proficient one construct is at predicting another [48]. Specifically, if the R** value is closer to one, the model will have a better ability to predict the adoption of the selected technology [47,48]. The presented model was able to describe 50% of the variance in behavioural intention, as shown in Figure 1.

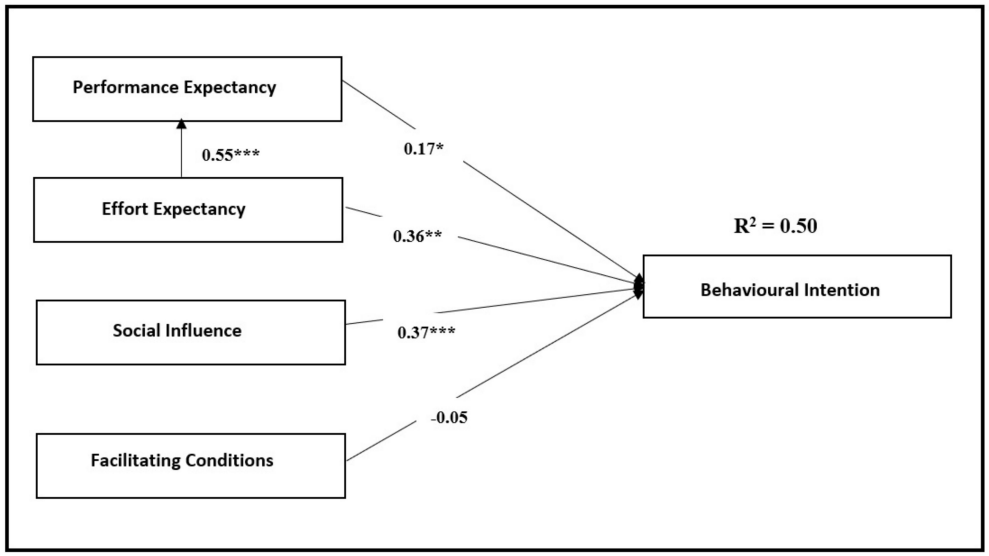

Figure 1. Structural model with the standardised path estimate. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

6. Discussion

Currently, the performance of small businesses is linked to the adoption of technology, such as mobile applications, to develop business sustainability [12–15]. Technology adoption by entrepreneurs has mostly been found in countries such as the US, Japan, China, and South Korea [10]. However, there are many uncertainties with start-ups in developing countries. Accordingly, entrepreneurs in developing countries need to adopt new and novel technologies such as mobile applications. Therefore, this paper examined factors affecting the adoption of mobile applications by women entrepreneurs in Saudi Arabia by using the UTAUT model. Using structural equation modelling, the model was then examined. Five hypotheses were presented to test the proposed model, and four of them were found to be significant.

H1 investigated the influence of PE on the BI to use mobile applications by women entrepreneurs. The relationship between PE and BI was supported (β = 0.71, $p = 0.022$). Three items were used from [6] to measure performance expectancy. PE is considered to be one of the most accurate predictors of the intention to use a technology [6]. As in most of the previous studies, the findings provide an indication that PE has a significant effect on BI when it comes to mobile application adoption by women entrepreneurs. H2 examined the effect of EE on BI for the use of mobile applications among women entrepreneurs. The

hypothesis was supported (β = 0.36, p = 0.007). Four items were used from [6] to measure effort expectancy. The hypothesis results indicate that EE has a significant influence on BI when it comes to the adoption of mobile applications by women entrepreneurs. H3 examined the impact of SI on the BI regarding the use of mobile applications by women entrepreneurs. The hypothesis was supported (β = 0.37, p = 0.000). Three items were utilised from [6] to measure social influence. The hypothesis findings prove that SI has an important effect on BI when it comes to the adoption of mobile applications by women entrepreneurs. H4 investigated the influence of FC on the BI for the use of mobile applications by women entrepreneurs. The hypothesis was not supported (β = −0.05, p = 0.686). Four items were used from [6] to measure facilitating conditions. The hypothesis results found that FC did not have an important influence on BI when it comes to the adoption of mobile applications by women entrepreneurs; therefore, the hypothesis was not supported. H5 examined the influence of EE on PE regarding mobile application use by women entrepreneurs. The relationship between EE and PE was supported (β = 0.55, p = 0.000). Four items were used from [6] to measure effort expectancy. Like most research in the context of technology adoption [31,38,46] that examines the impact of EE on PE, the findings deliver an indication that EE has an important effect on PE in relation to the adoption of mobile applications by women entrepreneurs.

The results of this study have theoretical as well as practical implications. For researchers, this study delivers an important theoretical contribution due to its use of the UTAUT model for the purpose of exploring the adoption of an innovative and contemporary technology in the form of mobile applications. Moreover, the present research extends the theoretical predictions of the UTAUT by exploring the effect of effort expectancy on performance expectancy. Practically, the results of this study offer entrepreneurs and managers an explanation of behavioural intention when it comes to the use of mobile applications by female entrepreneurs. It provides a suitable approach by identifying the factors that need further consideration to achieve the greatest benefits from the adoption of mobile applications by ensuring that women entrepreneurs accept recent methods of networking for the purpose of business sustainability. Furthermore, this study will help in informing application developers to understand the main factors that need additional consideration when they develop new applications for entrepreneurs; this will help business sustainability in a competitive environment.

According to the results of the current research, social influence, followed by effort expectancy, is the most significant predictor of the behavioural intention to adopt mobile applications. Furthermore, the effect of effort expectancy on performance expectancy was found to be the most significant predictor of mobile application adoption. This can guide entrepreneurs and managers to focus on effort expectancy and social influence. This can be achieved by ensuring that application developers build easy-to-use mobile applications. Furthermore, it is important to create positive reputations and promote the importance and benefits of using mobile applications among female entrepreneurs, which may increase the sustainability of their businesses.

7. Conclusions

In this study, the factors that influence women entrepreneurs' intentions to use mobile applications were evaluated. For the proposed conceptual model, the UTAUT was a sensible theoretical foundation. Additionally, this study investigated the effect of effort expectancy on performance expectancy. Using a field survey and self-administered questionnaires, data were gathered from a convenience sample to achieve study aims. The analysis and results were presented, starting with the demographics of respondents in the survey sample, followed by the respondents' experience with mobile applications. Afterwards, descriptive and normality tests were discussed. This was followed by a reliability test and common method bias. Structural equation modelling tests then were presented, including the measurement model, item loadings, validity assessment, and squared pairwise correlation. Lastly, the measurement model was changed into the structural model

and hypothesis testing was presented. The results show that social influence and effort expectancy have the most significant influence on behavioural intention when it comes to the use of mobile applications by women entrepreneurs. On the other hand, facilitating conditions were not found to be significant.

This study has some limitations. First, this study was limited by the fact that behavioural intention was observed rather than use behaviour. Upcoming research should examine use behaviour in the context of mobile application adoption. Second, this study examined the entrepreneurs' intention to use mobile applications rather than the intentions of their consumers. Future research should also explore consumers' adoption of mobile applications. Third, the population that this study examined was limited to the respondents living in Saudi Arabia; therefore, the findings are not generalisable to other populations. Forthcoming research should examine other nations and populations. Finally, the current study did not examine whether there was a moderating effect due to age, gender, experience, and voluntariness. Additional research should examine these moderating variables.

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