User's perceptions of perceived usefulness, satisfaction, and intentions of mobile application

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Abstract: Mobile applications (apps) have become ubiquitous in our daily lives. This research is focused on users' perceptions of mobile apps' usefulness and the influence they have on user satisfaction and intentions toward these mobile apps. The data was collected via a questionnaire, with 121 responses, by students enrolled in business courses at a medium-sized university in the USA. Using structural equation modelling, self-efficacy of mobile apps and two of the three perceived usefulness measures significantly influenced satisfaction. Mobile app use also facilitated information seeking and social relationships to influence perception of satisfaction with these apps. A discussion of these results and conclusions are also provided.

Keywords: perceived usefulness; behavioural intentions; user satisfaction; satisfaction with mobile apps.

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1 Introduction

Advances in mobile technologies have transformed the standard cell phone into an internet accessible 'smartphone' extending its functionality beyond voice communication (Lee et al., 2017). Currently, 95% of the US population own a cell phone and 77% of those phones are smartphones (Duggan et al., 2017; eMarketer, 2017; Sanakulov and Karjaluoto, 2015). The commonality of mobile technologies is even changing how some people access the internet often forgoing more traditional broadband access at home and instead relying on their smartphone (Lim et al., 2016; Yoon, 2016).

Mobile applications (apps), and their use, are growing in importance within global economies. Apps take advantage of the specific smartphone's operating system and provide functionality and services for users on the go. The unique characteristics of apps, as opposed to a website, are the need to download the app for functionality. On average, users interact with ten apps a day, around 30 apps in a month, and download approximately five apps per month (Dovaliene et al., 2015; Middleton, 2010; Perez, 2017b; Thompson, 2017). Ubiquity of apps in our daily lives results in growing demands on organisations to provide mobile app access to individuals (Jiannong et al., 2015). App stores such as iTunes and Google Play provide over 2.8 million apps to users for a variety of uses such as productivity, entertainment, and health and fitness. With this volume of apps available to users, a competitive market exists for app development and consumer engagement (Dovaliene et al., 2015; Tarute et al., 2017).

The research presented below is couched within this context. It focuses on users' perceptions of mobile apps' usefulness and the influence which these perceptions have on user satisfaction and intentions toward these apps. It is important for organisations to understand an individual's use of apps to remain competitive in this environment and for potentially engaging more users. By better understanding and addressing these uses in the design of mobile apps, organisations can positively influence users' satisfaction and ultimately drive the use of their apps.

The research is grounded in social cognitive theory applied to mobile apps and their use. The ultimate dependent variable is users' behavioural intentions to use mobile apps in the future. Users' perceptions of satisfaction with mobile apps are proposed to influence behavioural intentions. Perceptions of satisfaction are predicted to be influenced by the various perceptions of mobile app usefulness and users' self-efficacy regarding mobile apps. The self-efficacy of mobile app use is proposed to influence perceived usefulness and satisfaction. The theoretical antecedents of perceived usefulness and self-efficacy (i.e., personal mastery, vicarious experience, physiological arousal, and social normative variables) are excluded from the model. This omission was purposeful in order to focus the research on the perceived usefulness of mobile apps and its influence on satisfaction and behavioural intentions.

The manuscript is presented below in the following order. First, the literature and the model are presented. Next are the hypotheses and the research method including discussions of the sample, the measures, and the estimation of the model. Finally, a discussion of the research results, conclusions, and study limitations and directions for future research are provided.

2 The literature

Mobile apps have created a revolution in how individuals socialise and conduct personal and professional business. In fact, more people access the internet through mobile devices than through wired devices (Duggan et al., 2017; Jiannong et al., 2015). Furthermore, future worldwide smartphone use is expected to increase to 54%, compared to 77% usage in the USA (Duggan et al., 2017; eMarketer, 2017). Increasing smartphone usage drives the availability of apps. Beyond the large volume of apps available to users, revenues from the use and sale of these apps are increasing significantly. The projected revenue for 2017 is $138 billion in gross consumer spending on apps (Perez, 2017a, 2017b). The potential revenue from apps and the competitive market creates an opportunity for businesses to entice users to adopt their businesses' app. Understanding the individual's uses of these apps and their intention to adopt apps could allow businesses to capture a meaningful share of these revenues as well as the corresponding customers.

The technology acceptance model (TAM), extended from the theory of reasoned action (Ajzen and Fishbein, 1973, 1980), measures the influences of perceived ease of use and perceived usefulness in accepting technology. Understanding the factors that influence a user's perception of a technology such as a mobile app in terms of ease of use and usefulness have long been found to influence a users' intention to the technology (Davis, 1989; Davis et al., 1989; Venkatesh and Davis, 1996, 2000; Venkatesh et al., 2003). In an early study involving mobile apps, Nysveen et al. (2005) developed a model to explain consumer intentions to use mobile services. Their empirical study indicated strong support for motivational and attitudinal influences as well as normative pressure and perceived control on the intentions to use mobile services. Briz-Ponce and García-Peñalvo (2015) noted the increased reliance on mobile apps in medical education and used TAM to explain the intentions to use mobile apps. Their empirical study explained 46.7% of the variations in intentions. Two constructs, self-efficacy and recommendation, were the key factors to explaining the behavioural intention to use these mobile apps. An additional study of medical students also found usefulness and ease of use important factors on users' attitudes, but also highlighted external social influence effects on attitudes and intentions (Briz-Ponce et al., 2017). Baptista and Oliveira (2016) conducted a meta-analysis of mobile banking app use and found intentions and performance expectancy were meaningful predictors of use.

Age, gender, and personality types have also been examined in the context of mobile app usage behaviour. Unal et al. (2017) investigated different personality types regarding download behaviour. A correlation was found between the 'conscientiousness' personality type (competence, achievement, self-discipline, dutifulness) and the increased number of app downloads where apps are recommended. They found no gender differences regarding the volume of app downloads but there is a need to understand users' intention to use recommended apps and how to tailor recommendations to different user needs. Hwang et al. (2016) investigated modifying variables of gender and age through user experience and log data. The age variable was significant in the amount of use of social networking apps (younger users usages were higher than older users) whereas gender was not significant. Gender did influence the time spent on a social networking app. Additional research on mobile apps found convenience and quality influenced the enjoyment of the apps (Gurtner et al., 2014).

Kim et al. (2016) found that social usefulness of mobiles apps did not influence the behaviour of users. With the variety of other social communication options on a mobile phone, such as text messaging and e-mail, it could be that users do not need to download an app for sociality. On the other hand, short messaging services for advertising did influence behavioural intention related to trust (Zhang and Mao, 2008). Understanding how sociality of an app affects perceived usefulness could influence acceptance and ultimately potential revenue from mobile apps. An additional aspect of social usefulness is entertainment. Using an app while bored or waiting can be considered entertainment. Almost 30% of the apps available in the app stores are for games and entertainment. Social networking app usage is moderated by gender and age (Fang and Fang, 2016; Hwang et al., 2016).

In summary, from the above literature it appears that the use and creation of mobile apps is growing in volume and importance. The importance being both in terms of potential revenue for the business and the opportunity to build relationships with customers and potential customers. With millions of apps available for download, there are over a third of apps that are not downloaded. For these reasons, understanding users' behavioural intentions to mobile apps is important. Prior research has indicated the importance of ease of use, usefulness, personality, motivational and attitudinal influences, consequences and quality of mobile apps in influencing behavioural intentions and the use of these apps. The research presented here is focused on providing additional understanding regarding the roles of specific categories of perceived usefulness and the attitudinal variables of satisfaction and self-efficacy in explaining behavioural intentions to use mobile applications.

3 The model and hypotheses

The proposed model underlying the research is displayed in Figure 1 along with the hypotheses. Each hypothesis is discussed below grouped by the corresponding measures.

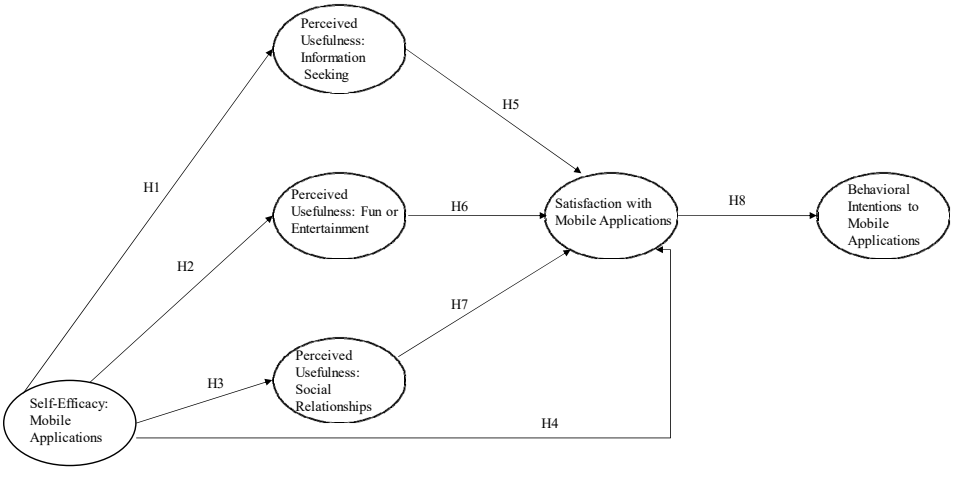
3.1 Influences of self-efficacy: mobile apps

Self-efficacy has been shown to influence a variety of affective and behavioural variables in numerous contexts (Alqurashi, 2016; Chen, 2017; Chiou and Wan, 2007; Hasan, 2007; Puente-Díaz, 2016; Yeşilyurt et al., 2016). The ability and skills of a user influences the intention to use a technology (Bandura, 1977, 1982, 2005; Stone and Henry, 1998). For example, smartphone users are more likely to use shopping apps as their familiarity and skill increases with the mobile environment (Kim et al., 2017). Therefore, within this research, users' self-efficacy of mobile apps are proposed to influence their perception of mobile app usefulness and their satisfaction with these apps. If a technology is perceived to be useful, an individual is more likely to adopt and use it in the future (Henry and Stone, 2001; Martinko et al., 1996).

Perceived usefulness is conceptualised as three distinct measures, perceived usefulness regarding using mobile apps for information seeking, fun or entertainment, and social relationships. Each of these dimensions of perceived usefulness has been examined in the context of mobile apps. Searching for and finding information in a library system was improved with a mobile app (Yoon, 2016). Hedonic quality, a user's pleasure with an interaction was measured for fun-oriented aspects related to app design

(Bhandari et al., 2017). The more social features added to an app, similar to social networks users are familiar with, tends to increase engagement and interaction (Tarute et al., 2017). The research presented here studies all three dimensions of perceived usefulness in one model and their influence on mobile app satisfaction.

Figure 1 The proposed theoretical model of mobile application perceived usefulness, satisfaction, and behavioural intentions



Notes: Correlations perceived usefulness measures: information seeking and fun/entertainment H9.
Fun/entertainment and social relationships H10.
Information seeking and social relationships H11.

The hypotheses are described below and shown on Figure 1.

Hypothesis 1 (H1) Self-efficacy: mobile apps are proposed to have a significant, positive influence on users' perceived usefulness: information seeking.

Hypothesis 2 (H2) Self-efficacy: mobile apps are proposed to have a significant, positive influence on users' perceived usefulness: fun or entertainment.

Hypothesis 3 (H3) Self-efficacy: mobile apps are proposed to have a significant, positive influence on users' perceived usefulness: social relationships.

Hypothesis 4 (H4) Self-efficacy: mobile apps are proposed to have a significant, positive influence on users' satisfaction with mobile apps.

3.2 Influences of perceived usefulness

There are millions of apps available from app stores and therefore there are many different apps available to accomplish a variety of tasks. Often, the most frequently used app categories are entertainment, business and productivity, education, and travel. A user perceives the usefulness of mobile apps based on what it can provide them. If an app is

categorised as entertainment, it is expected to be useful in providing entertainment. Therefore, perceived usefulness has been shown to influence a variety of perceptual variables, including satisfaction (Dogruel et al., 2015; Nysveen et al., 2005). The three distinct measures of users' mobile apps perceptions of usefulness are proposed to influence satisfaction with mobile apps in the model as stated by the hypotheses shown below.

Hypothesis 5 (H5) Perceived usefulness: information seeking is proposed to have a significant, positive influence on users' satisfaction with mobile apps.

Hypothesis 6 (H6) Perceived usefulness: fun or entertainment is proposed to have a significant, positive influence on users' satisfaction with mobile apps.

Hypothesis 7 (H7) Perceived usefulness: social relationships are proposed to have a significant, positive influence on users' satisfaction with mobile apps.

3.3 Influences of satisfaction with mobile apps

Satisfaction with a mobile app leads to continued use of the app (Xu et al., 2015). If the user perceives an app as providing satisfaction it will have meaningful impacts on the user's behavioural intentions. In the research presented here, it is proposed that users' satisfaction with mobile apps significantly influences users' behavioural intentions to mobile apps. The corresponding hypothesis is shown below.

Hypothesis 8 (H8) Satisfaction with mobile apps is proposed to have a significant, positive influence on users' behavioural intentions to mobile apps.

3.4 Influences among perceived usefulness measures

There are three measures of perceived usefulness used in this research. These can be viewed as three dimensions of an underlying construct of perceived usefulness. As such, it is logical that these three dimensions or measures would be correlated as all relate to the same underlying construct. These correlations are expressed below in three hypotheses.

Hypothesis 9 (H9) Perceived usefulness: information seeking and perceived usefulness: fun or entertainment is proposed to have a significant, positive correlation.

Hypothesis 10 (H10) Perceived usefulness: fun or entertainment and perceived usefulness: social relationships are proposed to have a significant, positive correlation.

Hypothesis 11 (H11) Perceived usefulness: information seeking and perceived usefulness: social relationships are proposed to have a significant, positive correlation.

4 Research methods

Given the theoretical model, data were collected to test the model and corresponding hypotheses by distributing a questionnaire. The subjects completing the questionnaire were undergraduate students enrolled in business courses at a medium-sized university in the Western United States. As a residential campus, the student age range is typically 18 to 22 years old. In considering the participants for this research, this student population age range has the highest percentage of smartphone use at 94% and is well versed in the use of mobile apps (Jiang, 2018).

The questionnaire was developed and distributed using the web-based survey program Qualtrics. The responding students were enrolled in one of three classes. Incentives to encourage students to complete the questionnaire were provided by making its completion part of a required class assignment or providing extra credit for its completion. The first class is a required course for all business majors typically completed in their freshman year or by students completing a business minor. A total of 21% of the sample respondents were enrolled in this course. The second class was also a required course for business majors, however business students typically complete this course in their junior year. 49% of the respondents were enrolled in this course. The final course in which the questionnaire was distributed was a junior-level class required in one of the business majors and used as an elective in the other business majors. 30% of respondents were enrolled in this class. No respondent was enrolled in more than one of these courses.

Table 1 The sample demographics

Gender	*Frequency*	*Percentage*
Male	86	71.07
Female	35	28.93
Total	121	100.00
Age group	*Frequency*	*Percentage*
18–20 years	50	41.67
21–24 years	59	49.17
25–34 years	8	6.67
35–44 years	2	1.67
45 years and older	1	0.83
Total	120*	100.01**
Year in school	*Frequency*	*Percentage*
Freshman	12	10.26
Sophomore	37	31.62
Junior	41	35.04
Senior	23	19.66
5th year	3	2.56
Graduate	1	0.85
Total	117*	99.99**

Notes: *Missing values.
**Details do not sum to 100% due to rounding.

5 The sample

The sample was composed of 121 questionnaire responses using the process described above. All of the students enrolled in the three classes completed the questionnaire, however one student's response was not usable due to missing values and was excluded from the sample therefore the total sample was 120 responses. Beyond the percentage of respondents from each class, the demographics of the sample are shown in Table 1. 71% of the respondents were male and 29% were female. In terms of age, 42% of the respondents were from the 18 to 20 year-old category while 49% of the respondents fell into the 21 to 24 year-old group. The remaining 9% of the respondents were spread across the remaining three age categories. The final demographic variable collected was the respondent's year in school. 10% of the respondents were freshmen, 32% were sophomores, 35% were juniors, 20% were seniors, and nearly 3.5% were either 5th year students or enrolled as graduate students.

6 The measures

The measures of the six constructs used in the empirical study were based on scales published in the literature. The three perceived usefulness measures were developed from the work of Kim et al. (2016). The self-efficacy measure was modified from the research of Bandura (Compeau and Higgins, 1995; Havelka, 2003). The satisfaction and behavioural intentions measures were developed by modifying the work of Xu et al. (2015). The questionnaire items used to measure the constructs are displayed in Table 2.

Table 2 The indicants, measures and psychometric properties using standardised path coefficients

Indicant		*Standardised path coefficient*	*Composite reliability*	*Percentage of shared variance extracted*
Perceived usefulness: information seeking			*0.81*	*59%*
Using mobile apps…				
1	Improves my information-seeking performance.	0.85		
2	Makes it easier to seek information.	0.74		
3	Is useful in seeking information.	0.71		
Perceived usefulness: fun or entertainment			*0.77*	*54%*
Using mobile apps…				
4	Improves my entertaining performance.	0.66		
5	Makes me playful.	0.75		
6	Is useful in having fun.	0.78		

Table 2 The indicants, measures and psychometric properties using standardised path coefficients (continued)

Indicant		*Standardised path coefficient*	*Composite reliability*	*Percentage of shared variance extracted*
Perceived usefulness: social relationships			*0.68*	*52%*
Using mobile apps…				
7	Improves my social performance.	0.79		
8	Is useful in having social relationships.	0.64		
Self-efficacy: mobile apps			*0.84*	*64%*
9	Learning to download mobile apps is easy for me.	0.72		
10	My interaction with mobile apps is clear and understandable.	0.91		
11	I found mobile apps easy to use.	0.76		
Satisfaction with mobile apps			*0.90*	*81%*
Overall I…				
12	Find using mobile apps positive.	0.87		
13	Feel favourable toward mobile apps.	0.93		
Behavioural intentions to mobile apps			*0.78*	*64%*
14	My general intentions to use mobile apps are high.	0.81		
15	I will continue to search mobile apps that I am interested in.	0.79		

In order to evaluate the psychometric properties of these measures, a confirmatory factor analysis was performed using PC SAS version 9.4. All the measures were reflective in their indicants (i.e., questionnaire items) and allowed to pairwise correlate. Using this approach, the cross-construct indicant loadings are forced to zero. The statistics summarising the quality of the fit between the data and the estimated model indicated a good fit (Hair et al., 1992; Hooper et al., 2008; Rainer and Harrison, 1993). The goodness of fit measure was 0.92 and adjusted for degrees of freedom it was 0.87. The parsimonious goodness of fit was 0.65. The root mean square residual was 0.03 and its standardised version was 0.05. The chi-square statistic was 85.60 with 75 degrees of freedom. It was statistically insignificant. The corresponding normed chi-square statistic was 1.14. The root mean square error of approximation was estimated to be 0.03 with a 90% confidence interval of 0.00 to 0.07. Bentler's comparative fit index was 0.96. The incremental fit indexes (i.e., Bentler and Bonett's non-normed and normed indexes; Bollen's normed and non-normed indexes) ranged from 0.87 to 0.99.

Using the standardised path coefficients from the confirmatory factor analysis results, the psychometric properties of the measures were evaluated. The measure of perceived usefulness: information seeking had standardised path coefficients of 0.85, 0.74, and

0.71. Using these estimated coefficients, the composite reliability statistic was 0.81 and the percentage of shared variance extracted was 59%. The perceived usefulness: fun or entertainment measure had estimated path coefficients of 0.66, 0.75, and 0.78. The calculated composite reliability coefficient and percentage of shared variance extracted were calculated to be 0.77 and 54%. The perceived usefulness: social relationship measure's standardised path coefficients were 0.79 and 0.64 with resulting composite reliability coefficient of 0.68 and 52% of shared variance extracted. The self-efficacy: mobile apps measure was formed by three items which had standardised path coefficients of 0.72, 0.91, and 0.76. The calculated composite reliability measure and percentage of shared variance extracted were 0.84 and 64%, respectively. The final two measures were formed by two questionnaire items each. The satisfaction with mobile apps measure had estimated path coefficients of 0.87 and 0.93. Its estimated composite reliability value was 0.90 with 81% of shared variance extracted. Behavioural intentions to mobile apps had path coefficients of 0.81 and 0.79 with a composite reliability statistic of 0.78 and 64% shared variance extracted.

Based on the magnitudes of the estimated standardised path coefficients that ranged from 0.64 to 0.93, it can be argued that item reliability was satisfied (Rainer and Harrison, 1993). However, the two measures (i.e., perceived usefulness: fun or entertainment and perceived usefulness: social relationships) with an estimated standardised path coefficient of less than 0.70 require additional refinement. In terms of composite reliability, all the measures demonstrated acceptable values based on the calculated reliability coefficients ranging from 0.68 to 0.90, however the perceived usefulness: social relationships measure with a composite reliability coefficient less than 0.70 requires additional refinement (Nunnally, 1978). Additionally, all the shared variance extracted percentages were above 50%. The combination of these results indicates that the measures may well satisfy convergent validity (Igbaria and Greenhaus, 1992; Rainer and Harrison, 1993).

Discriminant validity was also examined by comparing, for each pair of measures, its squared correlation to the individual measures' percentages of shared variance extracted. If discriminant validity is satisfied, the items within a measure share greater common variation among themselves than between the two measures. This is demonstrated when, for each measure pair, the individual measures' percentage of shared variance extracted is greater than the squared correlation between the two measures (Fornell and Larcker, 1981). All the correlations were calculated using the confirmatory factor analysis and are reported in Table 3 along with the squares of these correlations. The percentages of shared variance extracted are shown in Table 2. From these values, it is seen that discriminant validity was satisfied for all the measures. One estimated squared correlation between measures was larger than 0.52, the smallest calculated percentage of shared variance extracted. This squared correlation was 0.61 between satisfaction with mobile apps and behavioural intentions to mobile apps. The percentages of shared variance extracted for these two measures were 81% and 64%, respectively. Based on these values, all the percentages of shared variance extracted were greater than the squared correlations between the corresponding measures. Thus, discriminant validity is satisfied (Hair et al., 1992). Since convergent and discriminant validity are both satisfied, it can be argued that construct validity is satisfied (Hair et al., 1992).

Table 3 The correlations and squared correlations among the measures

Measure pairs	*Correlation*	*Squared correlation*
Perceived usefulness: information seeking – perceived usefulness: fun or entertainment	0.41	0.17
Perceived usefulness: information seeking – perceived usefulness: social relationships	0.48	0.23
Perceived usefulness: information seeking – self-efficacy: mobile apps	0.36	0.13
Perceived usefulness: information seeking – satisfaction with mobile apps	0.66	0.44
Perceived usefulness: information seeking – behavioural intentions to mobile apps	0.50	0.25
Perceived usefulness: fun or entertainment – perceived usefulness: social relationships	0.69	0.48
Perceived usefulness: fun or entertainment – self-efficacy: mobile apps	0.26	0.07
Perceived usefulness: fun or entertainment – satisfaction with mobile apps	0.49	0.24
Perceived usefulness: fun or entertainment – behavioural intentions to mobile apps	0.58	0.34
Perceived usefulness: social relationships – self-efficacy: mobile apps	0.33	0.11
Perceived usefulness: social relationships – satisfaction with mobile apps	0.63	0.40
Perceived usefulness: social relationships – behavioural intentions to mobile apps	0.45	0.20
Self-efficacy: mobile apps – satisfaction with mobile apps	0.65	0.42
Self-efficacy: mobile apps – behavioural intentions to mobile apps	0.46	0.21
Satisfaction with mobile apps – behavioural intentions to mobile apps	0.78	0.61

7 The estimation of the model

The proposed model displayed in Figure 1 was estimated using structural equations modelling and procedure Calis in PC SAS version 9.4. Maximum likelihood was the estimation method used. Each measure was reflective in the questionnaire items used to measure the underlying latent construct. The exogenous measure was scaled by setting its standard deviation equal to one while the endogenous measures were scaled by setting the path to one of its indicants equal to one.

The quality of the fit of the estimated model to the data is summarised by several statistics, which are shown in Table 4. The goodness of fit index was 0.91 and the

adjusted goodness of fit index was 0.86 while the parsimonious goodness of fit index was 0.68. The chi-square statistic was 94.45 with 79 degrees of freedom. The chi-square statistic was statistically insignificant at more than a 10% level. The normed chi-square statistic was 1.20 and the root mean square residual was 0.03 with its standardised counterpart estimated at 0.05. The root mean square error of approximation was 0.04 and its 90% confidence interval ranged from 0.00 to 0.07. The Bentler comparative fit index was 0.98 and the incremental fit indexes (i.e., Bentler-Bonett's normed and non-normed indexes and Bollen's normed and non-normed indexes) ranged from 0.86 to 0.98. These summary statistics indicate a good fit between the model and the data (Hair et al., 1992; Hooper et al., 2008; Rainer and Harrison, 1993). All these values are displayed in Table 4.

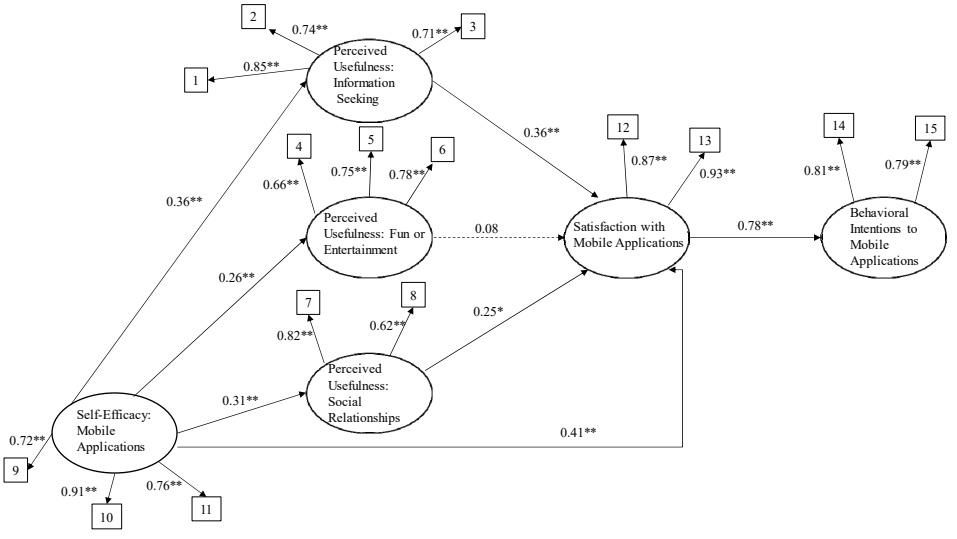
Table 4 The statistics summarising the fit of the model to the data

Statistic	*Value*
Goodness of fit index	0.91
Adjusted goodness of fit	0.86
Parsimonious GFI	0.68
Chi-square statistic	94.45^
Degrees of freedom	79
Normed chi-square statistic	1.20
Root mean square residual (RMSR)	0.03
Standardised RMSR	0.05
Root mean square error of approximation (RMSEA)	0.04
RMSEA lower and upper 90% confidence interval	0.00 to 0.07
Bentler's comparative fit index	0.98
Bentler and Bonett's non-normed index	0.97
Bentler and Bonett's normed index	0.89
Bollen normed index	0.86
Bollen non-normed index	0.98

Notes: **Significant at a 1% level.
^Statistically insignificant at more than a 10% level.

The details of the measurement and structural models estimations are shown in Figure 2 using standardised path coefficients. In the measurement model, all the paths between the measures and the corresponding indicants were statistically significant at a 1% level. The variance explained by each of the endogenous measures was: 13% for perceived usefulness: information seeking; 7% for perceived usefulness: fun or entertainment; 10% for perceived usefulness: social relationships; 70% satisfaction with mobile apps; and 61% for behavioural intentions to mobile apps. All the structural paths between the measures were also statistically significant at a 1% level, except for the path between perceived usefulness: fun or entertainment to satisfaction with mobile apps (H6). All the significant paths had the hypothesised signs. Additionally, the pair-wise correlations among the three perceived usefulness measures were all statistically significant. Thus, hypotheses H1–H5 and H7–H11 were statistically supported.

Figure 2 Estimation results of mobile application self-efficacy, perceived usefulness, satisfaction, and behavioural intentions using standardised coefficients



Notes: Correlations perceived usefulness measures.
Information seeking and fun/entertainment 0.12**.
Fun/entertainment and social/communication 0.30**.
Information seeking and social/communication 0.24**.
*Denotes significant at a 5% level.
**Denotes significant at a 1% level.

8 Discussion

The focus of this research is to better understand and explain users' intentions and satisfaction with mobile apps and the role of perceived usefulness of mobile apps in influencing both measures. In this context, the empirical results show that self-efficacy of mobile apps and two of the three perceived usefulness measures (i.e., information seeking and social relationships) significantly influence the satisfaction measure. These relationships explained 70% of the variation in satisfaction with mobile apps. The second objective of the research was to explain users' behavioural intentions toward these mobile apps. The path from satisfaction with mobile apps to behavioural intentions toward these apps was statistically significant. This relationship explained 61% of variations in these behavioural intentions. In a competitive app market place, with users downloading, accessing, and using apps regularly, a user who is not satisfied with an app can easily find another option. App developers must be cognisant of user satisfaction because of the many alternative apps available which influences intention or continued attention to use the app.

The research results also identified two distinct measures of perceived usefulness of mobile apps which influence satisfaction in a meaningful fashion. From these results, users perceive mobile apps facilitating information seeking and social relationships as meaningful in influencing their satisfaction with these apps. However, the results

explained very little of the variation in these perceived usefulness measures, which ranged from 7% to 13%. This may be explained by the fact that the only antecedent to these perceived usefulness measures included in the model was self-efficacy. The participants of this study were required to be smartphone owners and mobile app users. Their self-efficacy might be higher than a broader audience who are not as frequent users. The omission of other antecedents to self-efficacy was intentional though, as was the selection of the study participants, to allow the research focus on the determination of satisfaction and behavioural intentions.

Additionally, the influence of perceived usefulness for fun and entertainment on user satisfaction was not significant (H6). A user who is listening to music (entertainment) or playing a game (fun) is likely to return to the app (intention) but may not connect the usefulness to satisfaction. Investigation into this result could be informative as the usefulness of the app for fun and entertainment might be related to boredom and habituation (Fullwood et al., 2017). Other antecedents and more explicit measures might tease out this finding.

The empirical results show that self-efficacy, users' belief in their skills and ability to use mobile apps, influences all three perceived usefulness measures as well as the users' perceptions of satisfaction with mobile apps. Ultimately, through satisfaction, self-efficacy positively influences in meaningful way the users' behavioural intentions toward mobile apps. The implication is that if mobile apps are designed supporting users' belief in their abilities (self-efficacy), the above positive implications are encouraged. Similarly, these results indicate that if the mobile app is perceived by users to be useful, which in this research was facilitating information seeking and social relationships, users' satisfaction and ultimately behavioural intentions toward these apps are positively influenced.

9 Conclusions

The research shows the importance of users' self-efficacy and perceived usefulness regarding users' satisfaction and behavioural intentions toward mobile apps. Mobile apps have changed how we communicate, shop, and interact. The volume and variety of apps available makes the market very competitive for businesses developing such apps. Additionally, the number of apps and their impacts on consumers and other individuals provide opportunities for business as well as challenges.

10 Study limitations and directions for future research

The sample was drawn from undergraduate students, rather than a more general population, which limits this study. However, undergraduate students tend to use mobile apps frequently and represent the largest population of active mobile app users. It would be valuable to expand the research to include a broader population beyond undergraduate college students. Extending the population will help understand the most frequently used of apps for the different age ranges. Furthermore, the participants in this study were primarily from the USA and not broadly representative of the world population. Other cultures could have different usage patterns and satisfaction that would be beneficial to understand via future research.

Another limitation of the research and a direction for future research is to expand the antecedents to perceived usefulness to use mobile apps. Such research in the future could provide a better understanding of how mobile app developers can influence users' perceived usefulness, satisfaction, and intentions as well as better explain variations in the perceived usefulness measure. Other future research could include investigating the amount of time a smartphone user needs with a mobile app to perceive it as useful. Research that could capture information on the types of apps downloaded and the frequency of downloading new apps would be beneficial to developers. With over a million mobile apps available, it is important to address the correct user audience and market the apps to that audience.

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