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Understanding Mobile Financial Services Adoption through a Systematic Review of the Technology Acceptance Model

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Abstract

Various review studies were performed earlier to apprehend the applicability of the technology acceptance model (TAM) in the mobile financial services (MFS) context by assessing several issues. Despite each of those studies offering a valuable synthesis of TAM, further issues are still uncovered and call for further research. Therefore, this paper contributes to the existing literature by comprehensively reviewing TAM-based MFS studies through the analysis of various concerns, entailing the drivers of novelty technology of MFS adoption, analysis methods, TAM progress over publication years, participated countries, and sample size. From a yield of 217 studies collected, 24 empirical studies published between 2011 and 2021 have met the eligibility criteria and were extensively analyzed. The main results revealed that compatibility and perceived security were TAM's most common external factors influencing the adoption of mobile financial services, followed by subjective norm and trust. While it was developed in 1989, the results unveiled an increasing number of TAM-based MFS studies, yet, expanding the model's credibility in elucidating the users' intentions regarding technology adoption. Most analyzed studies have relied on questionnaires to collect empirical data. It was also found that the USA is leading the research on technology acceptance in MFS. This review will enhance practitioners' understanding through several contributions and implications by presenting the full potential of technology acceptance in MFS that could yield future attempts.

Keywords

Mobile Financial Services, Technology Acceptance Model, Systematic Review

1. Introduction

The increasing use of mobile devices via Internet networks has brought several

opportunities for mobile financial services (MFS) (Ha et al., 2012). It is predicted that the mobile Internet penetration rate will reach 71% of the world's population by 2025 (GSMA, 2018). Mobile financial services have become an appealing research trend for many scholars (Giovanis et al., 2021) (Gbongli et al., 2020), (Gbongli, 2017). The typology of mobile financial services entails three leading forms: mobile banking, mobile payment, and mobile money transfer (Gbongli et al., 2020) (FIRPO, 2009). With the advanced and dynamic development of technologies such as MFS, how fast the consumers accept these technologies depends on several factors, including the availability of technology, convenience, speedy transactions, security, and many others. There have been several researchers addressing the consumers' adoption of new technologies (Deb & Agrawal, 2017), (Liébana-Cabanillas et al., 2018), (Hussain et al., 2019) (Slade et al., 2013) (LAI, 2016). Such as the case with other technologies, mobile financial services technologies were examined using different technology acceptance models and theories. This is because those theories and models provide a better understanding of the users' behaviors toward a specific technology or service through the factors supporting them (Al-Maroof et al., 2022). It is believed that identifying these factors would enhance the effectiveness of MFS by enabling researchers to examine those factors and users' readiness to use MFS.

In order to comprehend the drivers of MFS adoption, some theoretical models were applied, entailing the "theory of reasoned action (TRA)" (Fishbein & Ajzen, 1975), "technology acceptance model (TAM)" (Davis, 1989), "unified theory of acceptance and use of technology (UTAUT)" (Venkatesh et al., 2003), and "theory of planned behavior (TPB)" (Ajzen, 1985), among many others. Among those, the TAM was regarded as one of the most commonly used theoretical models for predicting the adoption of several technologies due to its simplicity, adaptability, and soundness (King & He, 2006). More specifically, the TAM was recently found to be the most frequently theoretical model used to understand mobile banking adoption (Souiden et al., 2021). It was also argued that TAM has an efficient explanatory power and has been validated through several measurement scales (Venkatesh & Bala, 2008). The solid empirical support of TAM to its core variables, namely "perceived ease of use" and "perceived usefulness" in examining the individuals' adoption of several technologies, increased the applicability of the model across different disciplines (Alhassan et al., 2020) (Al Khasawneh, 2015) (Al-Qaysi et al., 2020) (Gbongli et al., 2019).

In line with the surveyed literature, many review studies were conducted to understand the applicability of TAM from the mobile financial perspective by examining several issues. Although each of those studies offered a valuable synthesis of TAM, further issues are still disclosed and call for further investigation. Therefore, this paper aims to offer a systematic review of existing TAM-based MFS studies to identify the factors affecting MFS adoption. Moreover, this systematic review also expects to examine the surveyed studies by considering other issues, comprising analysis research methods, TAM progress over publication

years, participative countries, and sample size. Stemming from this aim, the authors intend to answer the following research questions.

RQ1: What are the most frequent drivers of MFS adoption? RQ2: What are the dominant analysis research methods in assessing TAM-based MFS studies? RQ3: What is the progress of TAM-based MFS studies over publication years? RQ4: What are the most active countries in conducting TAM-based MFS studies? RQ5: What research sample size and method were used in the analyzed TAM-based MFS studies?

2. Method

This study employs a systematic review technique for reviewing published research studies on using TAM in the context of mobile financial services. We incorporate the well-known principle guidelines (Kitchenham, 2007) put forward in conducting systematic review studies and other relevant systematic reviews in the domain (Al-Saedi et al., 2019). These procedures were strictly followed as per the subsequent subsections.

2.1. Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were settled for the critical analysis of the articles related to our study to create a boundary and limit our methodology's scope. Table 1 displays these criteria and their rationale for inclusion or exclusion.

2.2. Data Sources and Search Strategies

The research studies used in the current systematic review were collected between 2011 and 2021. The electronic search was performed using an adapted query incorporating the boolean operators "AND" and "OR". The present study

Table 1. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Must contain mobile financial services (i.e., mobile banking, mobile payment, mobile money, mobile wallet) as an essential technology	TAM-based studies but not mobile financial services (MFS)
Must contain the TAM as a theoretical model.	MFS-based studies but not TAM
Must be written in English language only	Articles written in a language other than English
Accessibility to full-text articles.	Inaccessibility to full-text articles.
Must be published between 2011 and 2021.	Articles published earlier than 2011 or after 2021.
Empirical and conceptual academic articles published in peer-reviewed journals	All forms of publications other than research articles published in academic journals

used the following keywords to search for the targeted studies based on the Scopus database: ("Mobile Financial" OR "Mobile Payment" OR "Mobile wallets" OR "M-Payment" OR "M-Banking" OR "Mobile Banking" OR "Mobile" OR "m-money" OR "mobile money") AND ("technology acceptance model" OR "TAM"). Following the inclusion criteria, the time span for the search was set to include articles published between 2011 and 2021. By employing the specified keywords and time span, a total of 217 articles were obtained. Of those, 8 articles were found as duplicates; hence, they were removed. Therefore, the total number of remaining papers becomes 209.

The rest of the research articles underwent quality screening based on the most recent journals' rankings of the ABDC (Australian Business Deans Council) and the ABS (Association of Business Schools). The study retained only articles published in journals ranked (1) as A*, A, and B (therefore, excluding C and D ranked journals) regarding the 2022 ABDC journals' ranking or (2) as 4*, 4, 3, and 2 regarding the latest 2021 ABS ranking. Furthermore, the search and refinement phases were carried out in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Moher et al., 2009). The inclusion and exclusion criteria were applied for each article to confirm its importance to the research questions. Accordingly, 24 studies were found to meet the inclusion criteria, so these articles were included in the final stage of data analysis.

2.3. Data Coding and Analysis

In line with the research questions of this study, several attributes were coded and analyzed. These attributes include: 1) external factors to TAM, 2) analytical research methods (mixed methods, amongst others.), 3) publication year; 4) active participative countries, and 5) the sample size of participants.

3. Results and Discussion

The research questions of this study were addressed under the following subsections:

3.1. Progress of Technology Acceptance Model Studies in MFS Adoption

Table 2 analyzes the external factors impacting the adoption of mobile financial services. Over the 24 analyzed research papers, a total of 23 external factors were determined. It is essential to mention that merely the factors that appeared at least twice in the analyzed studies were accounted for in the review. Contrary to the earlier systematic review, which considered the core factors of the theoretical models in the analysis process (Ahmad, 2018), the current systematic review only considered the external factors to the original constructs of TAM, such as perceived usefulness, perceived ease of use, attitude towards use, behavioral intention, and actual use.

Table 2. Factors analysis.

Factors of MFS with TAM	Frequency	References
Perceived Security	7	(Khalilzadeh et al., 2017), (Chawla & Joshi, 2021), (Rafdinal & Senalasari, 2021), (Changchit et al., 2017), (Liébana-Cabanillas et al., 2018), (Liébana-Cabanillas et al., 2015), (Di Pietro et al., 2015)
Compatibility	7	(Chawla & Joshi, 2021), (Giovanis et al., 2021), (Giovanis et al., 2019), (Hussain et al., 2019), (Liébana-Cabanillas et al., 2018), (Liébana-Cabanillas et al., 2015), (Di Pietro et al., 2015)
Subjective Norm	6	(Giovanis et al., 2021), (Giovanis et al., 2019), (Purohit & Arora, 2021), (Zhang & Mao, 2020), (Liébana-Cabanillas et al., 2018), (Liébana-Cabanillas et al., 2015)
Trust	5	(Khalilzadeh et al., 2017), (Sharma, 2019), (Chawla & Joshi, 2021), (Liébana-Cabanillas et al., 2014), (Al Khasawneh, 2015)
Facilitating Condition	4	(Khalilzadeh et al., 2017), (Chawla & Joshi, 2021), (Giovanis et al., 2021), (Hussain et al., 2019)
Self-Efficacy	4	(Khalilzadeh et al., 2017), (Bailey et al., 2017), (Giovanis et al., 2019), (Alalwan et al., 2016)
Perceived Mobility	4	(Yen & Wu, 2016), (Zhang & Mao, 2020), (Liébana-Cabanillas et al., 2018), (Liébana-Cabanillas et al., 2015)
Risk	4	(Khalilzadeh et al., 2017), (Purohit & Arora, 2021), (Liébana-Cabanillas et al., 2014), (Alalwan et al., 2016)
External Influence	3	(Giovanis et al., 2021), (Giovanis et al., 2019), (Liébana-Cabanillas et al., 2014)
Innovativeness	3	(Rafdinal & Senalasari, 2021), (Liébana-Cabanillas et al., 2018), (Liébana-Cabanillas et al., 2015)
Perceived Cost	2	(Alhassan et al., 2020), (Goh & Sun, 2014)

Continued

Social Influence	2	(Khalilzadeh et al., 2017), (Hussain et al., 2019)
Perceived Credibility	2	(Goh & Sun, 2014), (Al Khasawneh, 2015)
Hedonic Performance Expectancy	1	(Khalilzadeh et al., 2017)
Utilitarian Performance Expectancy	1	(Khalilzadeh et al., 2017)
Technology Anxiety	1	(Bailey et al., 2017)
Satisfaction	1	(Suhartanto et al., 2020)

It can be seen that perceived security and compatibility are the most frequent factors affecting mobile financial services adoption, which appeared in seven studies. This is followed by subjective norm with six studies, Trust with five studies, facilitating condition, self-efficacy, perceived mobility, and perceived risk with four studies each, and external influence, innovativeness, and perceived mobility with three studies each. The rest of the depicted factors appeared in two studies only. These results support previous TAM-based mobile banking studies (Shareef et al., 2018), in which perceived security was a strong direct predictor of mobile banking adoption services through the lenses of TAM. Moreover, security and compatibility are some of the most important factors of mobile payment services (Di Pietro et al., 2015). An earlier study has also found that the strongest predictor of perceived usefulness appears to be perceived compatibility in mobile payment acceptance (Liébana-Cabanillas et al., 2018). Concerning the security and the perceived risk, these results suggest that users, especially from developing states, will be more cautious as they are more used to performing their monetary transactions face to face, based on the rationale that banking transactions generally comprise monetary transactions. From this perspective, the advancement of the security systems like eyes, voice, or fingerprint recognition can be used for mobile banking to create a secure user environment. Regarding compatibility factors, the results suggest that potential customers who feel mobile financial services are compatible with their needs, values, and previous experience will be highly willing to use the service (**Table 2**).

3.2. Distribution of Articles by Methods of Analysis

The bulk of studies (21 articles or 75%) on mobile financial services used structural equation modeling (SEM), partial-least square (PLS), and path analysis as the main tools of analysis (see **Table 3**). For the last two decades, SEM has become the most frequently adopted technique for many scholars assessing complex relationships between latent constructs (Astrachan et al., 2014). However, with the increasingly challenging requirements of covariance-based SEM (CB-SEM) regarding the distribution assumptions, sample size, and model complexity (Astrachan et al., 2014) (Hair et al., 2014), the use of the partial least squares SEM

Table 3. The primary method of analysis.

Main method of analysis	Frequency	Reference New
SEM, PLS, Path analysis	21	(Alhassan et al., 2020), (Khalilzadeh et al., 2017), (Sharma, 2019), (Bailey et al., 2017), (Suhartanto et al., 2020), (Yen & Wu, 2016), (Giovanis et al., 2019), (Baabdullah et al., 2019), (Hussain et al., 2019), (Rafdinal & Senalasari, 2021), (Purohit & Arora, 2021), (Liébana-Cabanillas et al., 2014), (Alalwan et al., 2016), (Al Khasawneh, 2015), (Zhang & Mao, 2020), (Liébana-Cabanillas et al., 2018), (Liébana-Cabanillas et al., 2015), (Di Pietro et al., 2015), (Goh & Sun, 2014), (Giovanis et al., 2021), (Su et al., 2018)
ANN	3	(Sharma, 2019), (Giovanis et al., 2021), (Liébana-Cabanillas et al., 2018)
Regression analysis	1	(Changchit et al., 2017)
Factor analysis	1	(Changchit et al., 2020)
Importance-Performance Map Analysis (IPMA)	1	(Chawla & Joshi, 2021)
ANOVA	1	(Chawla & Joshi, 2021)

(PLS-SEM), a less restrictive method, is receiving widespread popularity and success with scholars (Souiden et al., 2019). PLS-SEM applications have grown exponentially in the past decade (Leguina, 2015), especially in the social sciences (e.g., (Ali et al., 2018) (Ringle et al., 2020)), and its use is expanding in marketing (Kumar et al., 2020) (Buzeta et al., 2020) (Gbongli et al., 2019) and information system research (Chin et al., 2020). Artificial neural network (ANN) analyses were conducted in three studies. Regression analysis, factor analysis, importance-performance map analysis (IPMA), and ANOVA were used in one study only. None of the studies were found using the qualitative approach.

3.3. Country/Region Analysis

This review also determined each assessed study's origin country and region. As per **Table 4**, most publications were conducted in the USA (N = 5), with 20% of the analyzed studies. Spain recorded 12% (N = 3) of the entire analyzed studies. The rest of the statistics related to country and region are illustrated in **Table 4**. These results contradict the results noticed in previous related mobile financial service studies, particularly the studies on mobile payment (De Albuquerque et al., 2016), which indicated that Kenya was the most frequent country in conducting related studies. This contradiction in the studies can be explained by the

Table 4. Top countries by publication frequency.

Countries	Frequency	References
USA	5	(Khalilzadeh et al., 2017), (Bailey et al., 2017), (Changchit et al., 2020), (Changchit et al., 2017), (Zhang & Mao, 2020)
Spain	3	(Liébana-Cabanillas et al., 2014), (Liébana-Cabanillas et al., 2018), (Liébana-Cabanillas et al., 2015)
Indonesia	2	(Suhartanto et al., 2020), (Rafdinal & Senalasari, 2021)
India	2	(Chawla & Joshi, 2021), (Purohit & Arora, 2021)
Greece	2	(Giovanis et al., 2021), (Giovanis et al., 2019)
Jordan	2	(Alalwan et al., 2016), (Al Khasawneh, 2015)
Africa	1	(Alhassan et al., 2020)
Oman	1	(Sharma, 2019)
Taiwan	1	(Yen & Wu, 2016)
Malaysia	1	(Goh & Sun, 2014)
Saudi Arabia	1	(Baabdullah et al., 2019)
Bangladesh	1	(Hussain et al., 2019)
Thailand	1	(Changchit et al., 2020)
China	1	(Su et al., 2018)
Italy	1	(Di Pietro et al., 2015)

differences in the inclusion and exclusion criteria of the selected studies, which might also play a critical role. Equally, it can be ascribed to the differences in the underlying theoretical models of the selected studies.

3.4. Progress of Technology Acceptance Model Studies in MFS

The analyzed studies in the inspected period were categorized according to the year of publication, as presented in **Figure 1**. The studies are reflected through more or less constant frequency in the last eight years (2014-2018). The studies on mobile financial services did not show any articles using TAM from 2011 to 2013. This seems understandable as articles on new topics often face various challenges in publishing in the first years. It is essential to mention that we are dealing with articles that used only TAM with MFS as the study's model. Expectedly, the trend of publications on MFS has been slightly increasing and being constant during the subsequent years to reach four publications per year throughout the last three years (2019, 2020, and 2021) which can potentially minimize the gap in the technology acceptance literature, especially with the ongoing boom in information technologies.

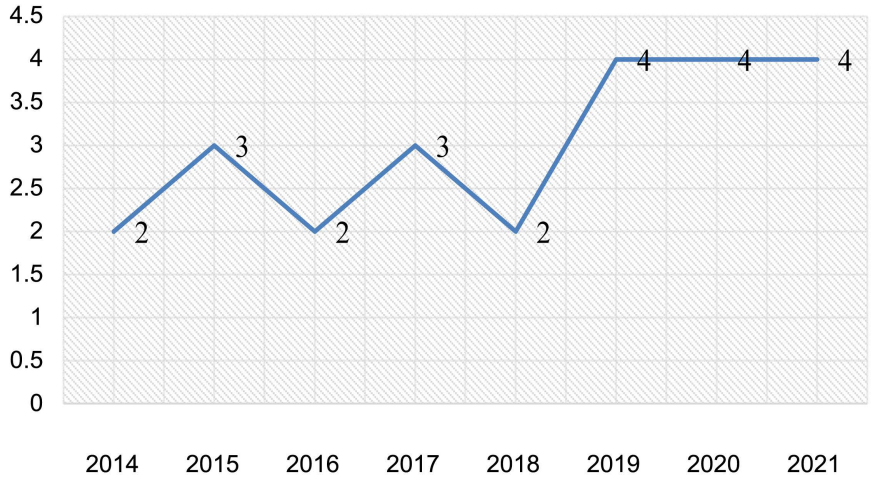

Figure 1. Frequency of studies per year.

3.5. Distribution by Sample Size and Research Methods

The identification of sample size is an essential task for empirical research studies. Insufficient and inappropriate sample sizes can impact the accuracy and quality of research studies (Pradel et al., 2003). Accordingly, this review study categorized the selected papers based on the sample size used in each article. **Table 5** reveals the distribution of the analyzed articles according to the sample size used. It is noticed that 33.33% of the analyzed articles relied on a sample size between 301 and 400 in conducting the empirical studies. This is followed by 201 to 300 with 20.83%, 101 to 200, 401 to 500, and 901 to 1000 together with 12.5%. There was also a sample size between 701 and 800 and above 2000 that yields 4.16%. However, no publications were found between the ranges of 501 to 900. It can also be noticed that the number of larger sample sizes is relatively small as compared with the number of small ones. Building upon small sample sizes might affect the generalization of results to the entire population.

As shown in **Table 6**, the selected articles were also assessed based on the employed research methods. It can be seen that 95.83% of the analyzed articles (N = 23) have primarily relied on questionnaire surveys for collecting empirical data. Of the 23 studies, 19 (i.e., 82.61%) adopted convenient sampling techniques for the survey data collection, and the remaining 4 (17.39%) relied on the quota sampling technique. These results patronize the results observed in earlier mobile financial services-related systematic reviews (De Albuquerque et al., 2016) (Abdullah & Naved Khan, 2021), which stressed that questionnaire surveys were the most extensive techniques for collecting data. The dominant employment of questionnaire surveys for data collection is attributed to two significant reasons. First, questionnaire surveys can effectively and quantitatively analyze the respondents' intentions (Al-Emran et al., 2019). Second, these tools can appropriately ascertain the correlations among the constructs in the theoretical model (Malhotra & Grover, 1998).

Table 5. Distribution by sample size.

Sample range	Number of studies	%
301 - 400	8	33.33%
201 - 300	5	20.83%
101 - 200	3	12.5%
401 - 500	3	12.5%
901 - 1000	3	12.5%
701 - 800	1	4.16%
Above 2000	1	4.16%
501 - 600	N/A	N/A
601 - 700	N/A	N/A
801 - 900	N/A	N/A

Note: N/A (Not Available).

Table 6. Detail on research methods, sample size adopted in MFS studies.

Authors	Country/region, Sampling method (SM), Sample size
(Alhassan et al., 2020)	Region: Africa; SM: Syst. S. ; Size: 480
(Khalilzadeh et al., 2017)	Country: USA; SM: Quota sample (QS); Size: 412
(Sharma, 2019)	Country: Oman; SM: CS; Size:225
(Bailey et al., 2017)	Country: USA; SM: CS; Size: 240
(Suhartanto et al., 2020)	Country: Indonesian; SM:CS; Size: 300
(Chawla & Joshi, 2021)	Country: India; SM: CS; Size: 744
(Yen & Wu, 2016)	Country: Taiwan; SM: CS; Size: 368
(Goh & Sun, 2014)	Country: Malaysia; SM: CS; Size: 105
(Giovanis et al., 2021)	Country: Greece; SM: CS; Size: 951
(Giovanis et al., 2019)	Country: Greece; SM: CS; Size: 931
(Baabdullah et al., 2019)	Country: Saudi Arabia; SM: CS; Size: 320
(Hussain et al., 2019)	Country: Bangladesh; SM: CS; Size: 247
(Rafdinal & Senalasari, 2021)	Country: Indonesia; SM: CS; Size: 400
(Purohit & Arora, 2021)	Country: India; SM: CS; Size: 332
(Liébana-Cabanillas et al., 2014)	Country: Spain; SM: QS; Size:2012
(Changchit et al., 2020)	Countries: USA, Thailand; SM: CS; Size: USA: 355; Size: Thailand: 400
(Alalwan et al., 2016)	Country: Jordan; SM: CS; Size: 343
(Al Khasawneh, 2015)	Country: Jordan; SM: CS; Size: 268

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(Changchit et al., 2017)	Country: USA; SM: CS; Size: 309
(Zhang & Mao, 2020)	Country: USA; SM: QS; Size: 394
(Liébana-Cabanillas et al., 2018)	Country: Spain; SM: QS; Size: 191
(Liébana-Cabanillas et al., 2015)	Country: Spain; SM: CS; Size: 168
(Su et al., 2018)	Country: China; SM: CS; Size: 922
(Di Pietro et al., 2015)	Country: Italy; SM: CS; Size: 439

Note: Sampling method (SM); Convenience sample (CS); Systematic sampling (Sys. S); Quota sample (QS).

4. Conclusion

4.1. Research Contributions and Implications for Future Research

This section provides the present systematic review's contributions and the implications it could yield for future attempts. First, identifying the most common factors affecting mobile financial services (MFS) adoption can support building a general model for elucidating MFS adoption regardless of context and subject. From this end, further study could extend the TAM with the most common drivers (factors) identified in this study to build a comprehensive model for MFS adoption. Second, it has been observed that the number of TAM-based mobile financial services studies is slightly increasing yearly. Despite its development in 1989, these results increase the credibility of the TAM in mobile financial services fields and its future applicability across various empirical studies. In this vein, with the continuous effective use of TAM, further research could keep using the model in explaining the users' intentions towards any technology. Third, information technology corporations (system analysts and developers) and financial organizations can utilize the findings related to the influential factors as lessons learned. Therefore, this review can support improving the currently implemented solutions and consider enhancements in future technology to be more compatible, secure, and innovative. This can encourage end-users to gain the maximum benefits without fear of making mistakes. Fourth, several countries were identified according to their participation in TAM-based MFS studies. This result could assist scholars in conducting further empirical studies in the non-listed countries and assessing the antecedents of the MFS adoption in such countries.

Fifth, it has been observed from the results that many of the analyzed studies were conducted with relatively small sample sizes. This might stem from the nature of the study and subjects and contexts in particular. In order to determine the required sample size in any empirical study, scholars might refer to two different sources. The first indicates the population size and the corresponding sample size to that population (Krejcie & Morgan, 1970). The second applied the G*Power tool by assessing the number of predictors in the theoretical model (Faul et al., 2009). Sixth, it has been perceived that most of the analyzed studies

have relied on questionnaire surveys in conducting their empirical data. Further attempts can highlight mixed methods in collecting data, including surveys and interviews. Mixed methods can contribute better to the understanding of respondents' perceptions quantitatively and qualitatively.

4.2. Limitations and Directions for Future Work

Although the study's results were quite exciting and played an essential role in providing an essential recapitulation of the TAM-based MFS studies, it also posits some limitations that need to be discussed. First, this study has concentrated on only a Scopus Database regarding the articles collection, which could lessen the amount of retrieved and analyzed articles. To handle this limitation, future trials could emphasize retrieving articles from the Web of Science and Scopus, as these two databases contain a vast amount of research articles. Therefore, based on our results, we found thoughtful gaps in the extant literature and recommended directions for future research in the field.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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