

An Innovative Study of E-Payment Systems Adoption in Higher Education: Theoretical Constructs and Empirical Analysis

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Said A. Salloum
University of Fujairah, Al Fujairah, UAE

Mostafa Al-Emran (✉)
Ton Duc Thang University, Ho Chi Minh City, Vietnam
a.l.emran@tdtu.edu.vn

Rifat Khalaf, Mohammed Habes
University of Fujairah, Al Fujairah, UAE

Khaled Shaalan
The British University in Dubai, Dubai, UAE

Abstract—Examining the adoption of e-payment systems is not a new research topic. Nevertheless, studying the factors affecting the adoption of e-payment systems in higher educational institutions is a new research trend. Thus, this study is considered one of the few that attempts to investigate the factors affecting the e-payment systems adoption in six different universities in the United Arab of Emirates (UAE). A total number of 289 students took part in the study. This study proposed a new research model in which the students' intention to use the e-payment systems are affected by five different factors including perceived benefit, performance expectancy, perceived risk, perceived security/privacy, and trust. The partial least squares-structural equation modeling (PLS-SEM) approach was used to validate the research model. The empirical results suggested that perceived benefit and performance expectancy have a significant positive relationship with the students' intention to use e-payment systems, whereas perceived security/privacy and perceived risk exhibited a significant negative relationship. However, the results triggered out that trust has an insignificant relationship with the students' intention to use e-payment systems. The results acquired from this research provide a fresh and an up-to-date information on the e-payment systems adoption in the higher educational institutions.

Keywords—E-payment, adoption, higher education, structural equation modeling, UAE.

1 Introduction

Individuals are now more inclined towards online transactions due to the progress and trust made in Internet technology, especially in the field of Internet banking [1]. Electronic payment (e-payment) is the core of Internet Banking, which refers to the online platform that forms the basis for online shopping, online auctions, and Internet stock trading [2]. Individuals using the Internet are benefitted through Internet banking as it is very convenient compared to the traditional payment methods that use cash or check for payment transactions while involving queues and physical visits.

It is argued that there are two types of perceived benefits that could be achieved while using online banking, and these are classified as direct and indirect advantages [3]. The tangible benefits achieved instantly by the customers are the direct advantages gained while using online banking. These benefits can be seen in the form of financial benefits, transaction speed, and increased information transparency. On the other side, the intangible benefits gained by customers through online banking are the indirect advantages [3]. The example in this regard is that online banking transactions can be carried out in anytime anywhere settings by providing better investment options and services to customers such as stock quotations and latest news [2].

It is anticipated that there is an increasing number of Internet banking users in general, and the e-payment systems in particular. However, the level of these systems acceptance by their end-users is still in short supply [4], [5]. Several restrictions were noticed in the traditional e-payment systems which could constrain the users from adopting them [6]. According to the previous research, the shortage of security, privacy, performance expectancy, trust, perceived benefits, and perceived risk are a few factors among these restrictions [7]. Prior to the usage of e-payment systems, the end-users must ensure that these factors are enabled effectively to make them convenient during the transaction processes. Conversely, it can be further stated that consumers may lose confidence in online activities in the case that these fundamentals are not met in the payment systems, which may result in the loss of business opportunities.

Security is among the most significant issues that has engulfed the e-payment systems. Owing mainly to the fact that there is no personal contact is created among the stakeholders before the transfer of funds and information online. The credit card scam is the biggest worry in this regard [8]. Customers making e-payments are also threatened by another factor that is perceived risk [6]. Hackers are always looking for personal information and credit card particulars that form a major threat, which is another concern for customers. E-payment transactions should be trustworthy enough as this represents the core of online applications usage and adoption [7].

In the education sector, the higher educational institutions are working hard to encourage the use of e-payment systems; however, the rate of students adoption is still quite low [9], [10]. The benefits of e-payment services are depreciated due to the concerns observed in the face of privacy and security. A large number of research was conducted to examine the factors affecting the consumers adoption of e-payment systems [11]–[13]. According to the literature, it has been argued that the main constituents of the consumer market are the business executives, university students, and retail users of banking services [1], [14]–[17].

Among those users, the university students' adoption of e-payment systems is still in short supply, and requires further examination. The importance of those users' adoption refers to the fact that university students constitute a considerable major part in the market due to their educational status and extensive usage of Internet services. In addition, technology adoption has become a key research field by many information systems scholars, and this refers to the fact that the factors affecting these technologies are varied from one context to the other [18]–[20]. E-payment systems are one of such technologies that attracted the attention of many scholars. However, there is a limited number of research studies conducted to understand the factors affecting e-payment adoption in higher education. Based on the previous assumptions, the present study is an attempt to empirically examine the factors affecting the university students' adoption of e-payment systems in six different universities in the United Arab of Emirates (UAE).

2 Research Model and Hypotheses Development

The research model of this study is developed through the integration of five different factors, namely perceived benefit, perceived security/privacy, perceived risk, trust, and performance expectancy along with the intention to adopt e-payment systems. Figure 1 demonstrates the developed research model.

2.1 Perceived benefit

Perceived benefit (PB) refers to “the perception of the positive consequences that are caused by a specific action” [21]. The perceived benefit of e-payment system refers to the overall payment experience by saving time and vigor and providing more scenarios to financial benefits [22]. According to the literature, perceived benefit was shown to have a significant effect on internet banking [2], and corporate website adoption [23]. Thus, the following hypothesis is formulated:

H1: Perceived benefit has a positive impact on students' intention to adopt e-payment system.

2.2 Perceived security/privacy

Perceived security (PS) refers to a “consumer's perception that the Internet vendor will fulfill security requirements such as authentication, integrity, encryption, and non-repudiation” [24]. Perceived privacy and perceived security are connected to each other where perceived privacy is a part of perceived security. The opinion regarding privacy risk and inadequate security in Internet banking was shown to have an impact on the customers' adoption [25], [26]. The biggest hindrance to online banking usage is the security issues; thus, the utilization of e-payment systems is affected [27]. As a result, it can be said that the users' decision to use e-payment systems is dependent on the security/privacy [23]. Therefore, the following hypothesis is formulated:

H2: Perceived security/privacy has a negative impact on students' intention to adopt e-payment system.

2.3 Perceived risk

Perceived risk (PR) is defined as the direct effect in the online transaction of users' adoption intention [28]. According to the literature, perceived risk was revealed to have a significant effect on the adoption of e-payment systems [1], [6], [29]–[32]. As a result, this study formulates the following hypothesis:

H3: Perceived risk has a negative impact on students' intention to adopt e-payment system.

2.4 Trust

Trust refers to the extent to which the individuals' trust in e-payment systems can be accomplished through the accumulation of individuals' beliefs of integrity and ability to leverage their willingness to use e-payment systems in their financial transactions [11]. It is believed that the higher the trust in the e-payment systems, the lower the risk associated with such systems is perceived [23]. According to the extant literature, trust was found to have a significant impact on the consumers' adoption of e-payment systems [11]–[13], [17], [33]–[35]. Therefore, this leads to the following hypothesis:

H4: Trust has a positive impact on students' intention to adopt e-payment system.

2.5 Performance expectancy

Performance expectancy (PE) refers to “the degree to which an individual believes that applying the technology will help him or her to attain gains in job performance” [36]. Individuals can only be inclined to use and accept a particular technology when they realize that using the technology will add more benefits to their daily lives [11], [36]. Performance expectancy was found to be a significant factor in determining the behavioral intention to use e-payment systems [1], [11], [33], [37]–[39]. Thus, this study formulates the following hypothesis:

H5: Performance expectancy has a positive impact on students' intention to adopt e-payment system.

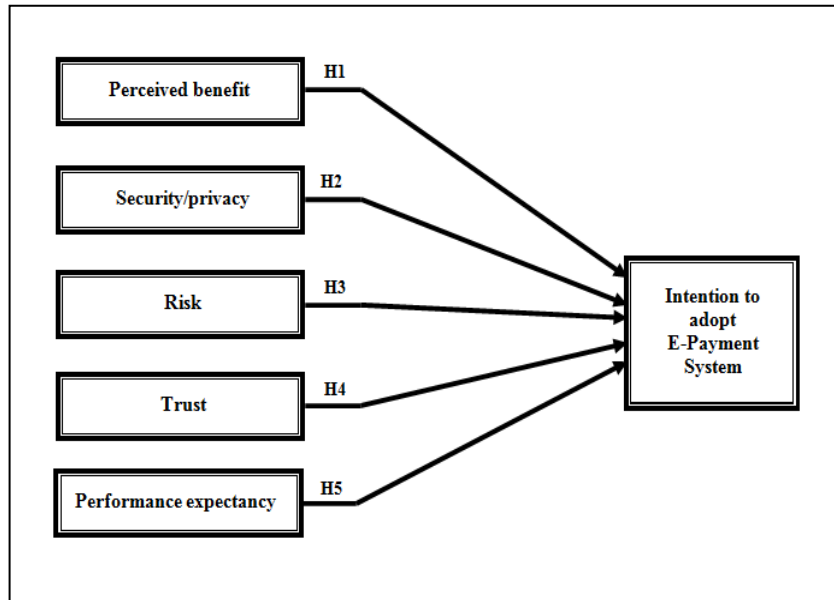


Fig. 1. Research model

3 Research Methodology

3.1 Data collection

The university students in six different universities in the United Arab of Emirates (UAE) are the target population of this study. These universities include Abu Dhabi School of Management (ADSM), Al Ain University of Science and Technology (AAU), The British University in Dubai (BUiD), University of Dubai (UOD), University of Fujairah (UOF), and University of Sharjah (UOS). The convenience sampling approach is employed during the process of data collection. This was the same procedure followed in recent studies concerning technology adoption and acceptance [40]–[42]. In order to determine the minimum required sample size, the G*Power tool was employed [43]. The G*Power parameters include the values of 0.35 as the effect size, 0.01 as the error type (α), 0.8 as the power, and 5 as the number of predictors. The minimum required sample size was found to be 193. Accordingly, a total of 300 questionnaire surveys were distributed among the students in the targeted universities. 11 responses were dropped out due to the missing values observed in most of the items in the survey. Overall, there were 289 valid responses in hand which could be used for further analysis.

3.2 Instrument development

Most of the researchers refer to the currently available measurements in the literature that perform well in previous studies [44], [45]. This is the same procedure followed in the present study. The constructs, number of items, and their corresponding sources are demonstrated in Table 1. The participants have to state their levels of agreement to the given constructs by reacting to the survey items. The answer to each item follows the five-point Likert scale in which “1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree”.

Table 1. Constructs and their sources

Constructs	Number of items	Source
Intention to adopt E-Payment System	6	[11], [33], [46], [38], [38]
Perceived benefit	4	[2], [46], [23], [22]
Performance expectancy	4	[11], [33], [39], [47], [38]
Risk	4	[39], [32], [2], [34]
Security/privacy	4	[2], [47], [35], [23], [48]
Trust	4	[11], [12], [2], [35], [23]

4 Findings and Discussion

4.1 Data analysis

In order to analyze the collected data and examine the formulated research hypotheses, the Partial Least Squares-Structural Equation Modeling (PLS-SEM) approach was employed using Smart PLS 3.2.7 [49]. This study follows a two-step approach in validating the developed model; these two steps include the assessment of both the “measurement model” and “structural model”. The measurement model (outer model) represents the relationship between the constructs and their indicators, whereas the structural model (inner model) refers to the relationship between the latent constructs [50].

4.2 Sample profile

Table 2 exhibits the respondents’ characteristics, in which 47% of them were males, and 53% were females in which this ratio is usually observed in most of the studies in the domain. Most of the respondents were bachelor and master’s degree students (39%), aged between 18 and 29 years (56%). The majority of the respondents were under the College of Business Administration (35%) and the College of Engineering and Information Technology (30%). Most of the respondents were located in the Emirate of Fujairah (32%).

Table 2. Respondents' characteristics

Variables	Answers	Frequency	Percentage
Gender	Female	153	53%
	Male	136	47 %
Age	18 to 29	163	56%
	30 to 39	74	26%
	40 to 49	34	12%
	50 to 59	18	5%
College	College of Business Administration	102	35%
	College of Humanities and Social Sciences	33	12%
	College of Engineering and Information Technology	86	30%
	College of General Education	41	4%
	College of Mass Communication and Public Relations	27	9%
Level of education	Bachelor	114	39%
	Master	113	39%
	Doctorate	62	22%
Location	Abu Dhabi	39	14%
	Dubai	84	29%
	Sharjah	18	6%
	Ajman	20	7%
	Umm al-Quwain	18	6%
	Ras al-Khaimah	18	6%
	Fujairah	92	32%

4.3 Measurement model assessment

Hair and his colleagues suggested estimating the internal consistency reliability, convergent validity, and discriminant validity for assessing the measurement model [50]. The internal consistency reliability was measured using the composite reliability (CR) and Cronbach's alpha. The convergent validity was measured using the factor loading, and average variance extracted (AVE). The discriminant validity was assessed using the Fornell-Larcker criterion, cross-loadings, and the Heterotrait-Monotrait ratio (HTMT).

As illustrated in Table 3, the Cronbach's alpha and CR values of all the variables were greater than the suggested value of 0.7. Moreover, the values of factor loadings of all the items were greater than the recommended value of 0.7. Additionally, the AVE values of all the constructs in the model were greater than the threshold value of 0.5. Therefore, the convergent validity and the internal consistency reliability were confirmed.

Table 3. Convergent validity and internal consistency reliability

Constructs	Items	Factor Loading	Cronbach's Alpha	CR	AVE
Intention to adopt E-Payment System	ADOPTION_1	0.783	0.863	0.897	0.594
	ADOPTION_2	0.789			
	ADOPTION_3	0.815			
	ADOPTION_4	0.819			
	ADOPTION_5	0.785			
	ADOPTION_6	0.791			
Perceived benefit	BENEFIT_1	0.867	0.873	0.913	0.724
	BENEFIT_2	0.896			
	BENEFIT_3	0.820			
	BENEFIT_4	0.817			
Performance expectancy	PER_EXP_1	0.788	0.753	0.833	0.559
	PER_EXP_2	0.784			
	PER_EXP_3	0.831			
	PER_EXP_4	0.841			
Risk	RISK_1	0.877	0.777	0.857	0.601
	RISK_2	0.812			
	RISK_3	0.809			
	RISK_4	0.796			
Security/privacy	SEC_PRIV_1	0.784	0.792	0.864	0.615
	SEC_PRIV_2	0.772			
	SEC_PRIV_3	0.848			
	SEC_PRIV_4	0.778			
Trust	TRUST_1	0.787	0.814	0.878	0.642
	TRUST_2	0.825			
	TRUST_3	0.797			
	TRUST_4	0.796			

Table 4 shows the Fornell-Larcker criterion, in which the square roots of AVE should be greater than its correlation with other constructs [51]. It is exhibited from Table 4 that the Fornell-Larcker criterion is confirmed. Table 5 shows the cross-loadings results, in which the loading of each indicator should be higher than the loadings of its corresponding constructs' indicators. As it can be seen from Table 5, the cross-loadings criterion is ascertained. Table 6 shows the HTMT ratio, in which the values of each construct should not exceed the threshold value of 0.85 [52]. Based on the readings in Table 6, the HTMT ratio is met. As a result, the discriminant validity is confirmed. The analyses results provide an evidence that there were no issues regarding the assessment of the measurement model in terms of its reliability and validity, and thus, the gathered data can be further used to evaluate the structural model.

Table 4. Fornell-Larcker criterion

	Intention to adopt E-Payment System	Perceived benefit	Performance expectancy	Risk	Security/privacy	Trust
Intention to adopt E-Payment System	0.771					
Perceived benefit	0.605	0.851				
Performance expectancy	0.565	0.468	0.748			
Risk	0.619	0.618	0.493	0.775		
Security/privacy	0.491	0.660	0.387	0.588	0.784	
Trust	0.623	0.521	0.576	0.668	0.523	0.801

Table 5. Cross-loadings

Items	Intention to adopt E-Payment System	Perceived benefit	Performance expectancy	Risk	Security/privacy	Trust
ADOPTION_1	0.783	0.440	0.442	0.510	0.387	0.479
ADOPTION_2	0.789	0.530	0.421	0.523	0.422	0.453
ADOPTION_3	0.815	0.501	0.410	0.520	0.445	0.495
ADOPTION_4	0.819	0.485	0.470	0.507	0.376	0.581
ADOPTION_5	0.785	0.372	0.368	0.349	0.298	0.434
ADOPTION_6	0.791	0.454	0.498	0.430	0.330	0.431
BENEFIT_1	0.540	0.867	0.453	0.544	0.584	0.451
BENEFIT_2	0.588	0.896	0.411	0.549	0.553	0.455
BENEFIT_3	0.465	0.820	0.408	0.516	0.508	0.446
BENEFIT_4	0.446	0.817	0.309	0.492	0.613	0.422
PER_EXP_1	0.278	0.218	0.788	0.280	0.198	0.301
PER_EXP_2	0.263	0.207	0.784	0.271	0.186	0.279
PER_EXP_3	0.507	0.385	0.831	0.396	0.337	0.535
PER_EXP_4	0.536	0.488	0.841	0.472	0.369	0.516
RISK_1	0.439	0.559	0.404	0.877	0.603	0.486
RISK_2	0.500	0.539	0.371	0.812	0.435	0.521
RISK_3	0.515	0.453	0.390	0.809	0.400	0.519
RISK_4	0.460	0.370	0.367	0.796	0.404	0.546
SEC_PRIV_1	0.428	0.581	0.278	0.498	0.784	0.432
SEC_PRIV_2	0.293	0.479	0.241	0.439	0.772	0.347
SEC_PRIV_3	0.413	0.537	0.294	0.511	0.848	0.434
SEC_PRIV_4	0.380	0.459	0.391	0.386	0.778	0.410
TRUST_1	0.464	0.424	0.398	0.530	0.444	0.787
TRUST_2	0.525	0.413	0.430	0.548	0.375	0.825
TRUST_3	0.475	0.407	0.501	0.527	0.413	0.797
TRUST_4	0.528	0.425	0.514	0.535	0.446	0.796

Table 6. Heterotrait-Monotrait Ratio (HTMT)

	Intention to adopt E-Payment System	Perceived benefit	Performance expectancy	Risk	Security/privacy	Trust
Intention to adopt E-Payment System						
Perceived benefit	0.688					
Performance expectancy	0.647	0.524				
Risk	0.750	0.753	0.615			
Security/privacy	0.581	0.791	0.461	0.754		
Trust	0.740	0.618	0.685	0.841	0.645	

4.4 Structural model assessment

In order to assess the structural model, the path analysis and coefficient of determination (R^2) were measured [50]. The predictive accuracy of the model is determined through the R^2 value. As exhibited in Figure 2, the developed model explains 63.6% of the variance in the intention to adopt e-payment system. As demonstrated in Table 7, all the formulated hypotheses were accepted with an exception to hypothesis 4. Hypothesis 1 suggested that perceived benefit has a positive impact on students' intention to adopt e-payment system. According to the results in Table 7 and Figure 2, it can be seen that there is a significant positive relationship between perceived benefit and the intention to adopt e-payment system ($\beta = 0.265$, $p < 0.01$). Hence, hypothesis 1 is accepted.

Hypothesis 2 suggested that perceived security/privacy has a negative impact on students' intention to adopt e-payment system. As per the results in Table 7 and Figure 2, it can be noticed that there is a significant negative relationship between perceived security/privacy and the intention to adopt e-payment system ($\beta = 0.210$, $p < 0.01$). Therefore, hypothesis 2 is supported. Hypothesis 3 assumed that perceived risk has a negative impact on students' intention to adopt e-payment system. With respect to the results in Table 7 and Figure 2, it can be observed that there is a significant negative relationship between perceived risk and the intention to adopt e-payment system ($\beta = 0.196$, $p < 0.05$). Thus, hypothesis 3 is accepted.

Hypothesis 4 suggested that trust has a positive impact on students' intention to adopt e-payment system. As per the results in Table 7 and Figure 2, it is found that there is an insignificant relationship between trust and the intention to adopt e-payment system ($\beta = -0.003$, $p > 0.05$). Hence, hypothesis 4 is rejected. Hypothesis 5 suggested that performance expectancy has a positive impact on students' intention to adopt e-payment system. According to the results in Table 7 and Figure 2, it can be seen that there is a significant positive relationship between performance expectancy and the intention to adopt e-payment system ($\beta = 0.235$, $p < 0.01$). Hence, hypothesis 5 is accepted.

Table 7. Structural model results (significant at $p^{**} \leq 0.01$, $p^* < 0.05$)

H	Relationship	Path Coefficient	t-value	Decision
H1	Perceived benefit → Intention to adopt E-payment System	0.265	2.966	Supported**
H2	Security/privacy → Intention to adopt E-payment System	0.210	3.128	Supported**
H3	Risk → Intention to adopt E-payment System	0.196	2.482	Supported*
H4	Trust → Intention to adopt E-payment System	-0.003	0.048	Not supported
H5	Performance expectancy → Intention to adopt E-payment System	0.235	2.781	Supported**

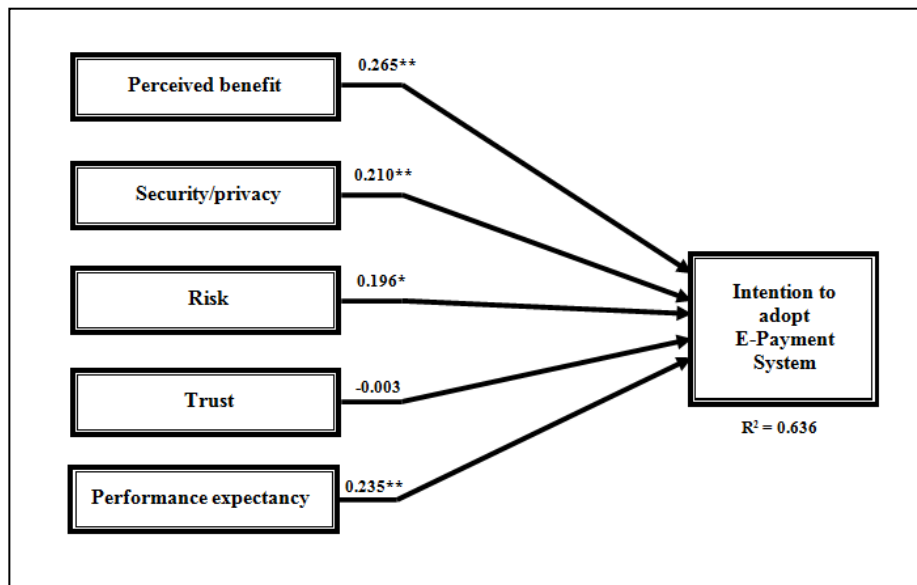


Fig. 2. Path analysis results (significant at $p^{**} \leq 0.01$, $p^* < 0.05$)

5 Conclusion

5.1 Contributions and implications

Technology adoption has become a key research field by many information systems scholars, and this refers to the fact that the determinants affecting these technologies are varied from one context to the other [53]–[56]. E-payment systems are one of such technologies that attracted the attention of many scholars. The main purpose of this study is to gain an insight into the factors affecting the university students' intention to use e-payment systems in the UAE. This study proposed a new research model in which the students' intention to use the e-payment systems are affected by five different factors including perceived benefit, performance expectancy, perceived

risk, perceived security/privacy, and trust. The findings indicated that perceived benefit and performance expectancy have a significant positive relationship with the students' intention to use e-payment systems. It was also found that perceived security/privacy and perceived risk have a significant negative relationship with the students' intention to use e-payment systems. These results were in agreement with the recent studies in the domain [11]–[13], [32]–[34]. Conversely, the results point out that trust has an insignificant relationship with the students' intention to use e-payment systems. Additionally, the model explains 63.6% of the variance in the intention to use the e-payment systems.

Although several studies were conducted to examine the e-payment adoption, it was argued that there were a few number of studies undertaken in the higher educational institutions in general, and the UAE context in particular [10]. Therefore, this study and its findings contributed to the e-payment adoption literature by developing a new model that could be able to predict the students' intention to use the e-payment systems in the higher educational institutions in general, and the UAE context in particular.

5.2 Limitations and future research directions

While this study adds a significant contribution to the e-payment literature, it also has some limitations that needs to be considered while conducting further research. First, the data collection was constrained to the higher educational institutions in the UAE. Hence, caution is warranted when generalizing the results to other educational institutions contexts. Second, the study employed the convenience sampling technique in terms of data collection, which may limit the generalization of the research findings. Thus, further research should take this point into consideration.

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7 Authors

Said A. Salloum is the manager of computer center at University of Fujairah, Al Fujairah, UAE.

Mostafa Al-Emran is a researcher at Applied Computational Civil and Structural Engineering Research Group, Faculty of Civil Engineering, Ton Duc Thang University, Ho Chi Minh City, Vietnam.

Rifat Khalaf is an assistant professor in Accounting at University of Fujairah, Al Fujairah, UAE.

Mohammed Habes is a researcher at University of Fujairah, Al Fujairah, UAE.

Khaled Shaalan is a professor of Computer Science at Faculty of Engineering & IT, The British University in Dubai, Dubai, UAE.

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