Factors Influencing User Satisfaction in UAE by using Internet

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ABSTRACT: The present study focuses on analysis of the effectiveness of the proposed model by utilizing structural model of equations through SmartPLS 3.0. Delone & Mclean information system success model assessed the elements showing an impact on the satisfaction levels of the employees in terms of Internet utilization in UAE's governmental sectors. Criteria including system quality, information quality, and service quality are considered as independent constructs and the present study also discusses about the relationship among them. Our work has improved our insight into the importance of satisfaction in using internet technology. The study findings were in support of significant effectiveness of the independent parameters in the user satisfaction. Nearly 48.7% of the user satisfaction variance rate has been narrated in the model proposed in this study.

I. INTRODUCTION

Internet has quickly become essential to most of our daily activities and has significantly influenced every aspect of operations in organizations. It has also become a crucial component in knowledge management to enhance decision quality, communication quality, task efficiency and knowledge acquisition. The gradual need of environmental changes in varied institutions have led to the requirement of new technologies at a rapid speed. In this IT era of 21st Century, institutions and organizations have started to invest in Internet related establishments for various competitive benefits [1,2]. Consequently, Information Technology is not exclusive to the workplace but has also become widespread in public areas and houses. Technology is going to give us the tools to make us independent, imagine the world in which everything becomes an application on the internet. The UAE comes second in terms of the population percentage that are using the internet with a whopping 90.6% (Fig. 1) which is considered among the highest in the world [3].
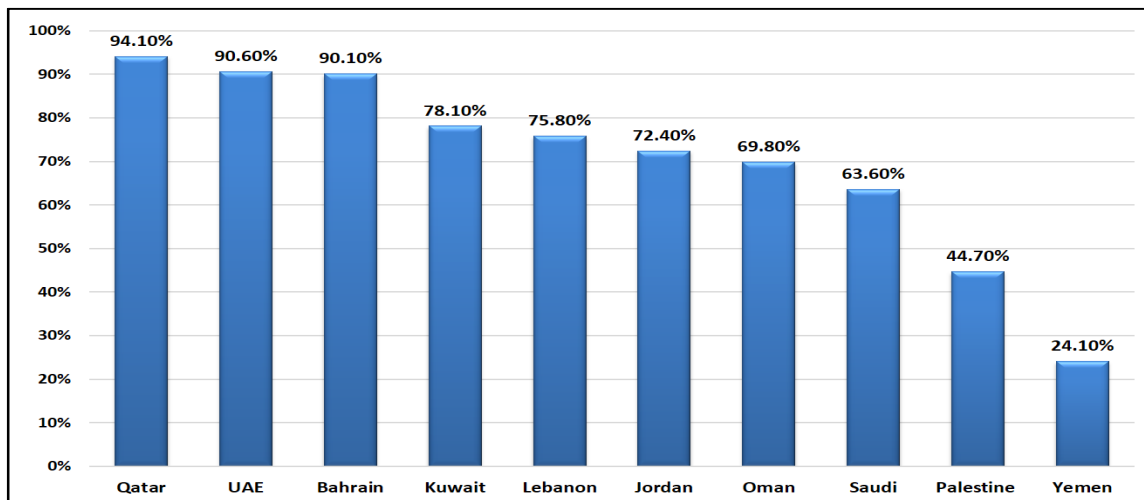

Fig. 1. Percentage of population using Internet (UAE vs. Arab countries) Source: (Internet World Stats, 2017).

According to the Global Competitiveness Report [4], the UAE ranked above the middle east average in terms of development in all 12 pillars. Specifically, in technological readiness and also innovation, which makes it on track to utilize the benefit of the internet in all public sector. Additionally, the institutions and infrastructure in the UAE are well developed which reflect the efforts of the government of the UAE to improve the performance of the public sector and private sector organizations as well.

Most of the studies in the information system field in Middle East focus on the factors that influence the intention or actual usage of technology applications [5], however, this study aims at investigating the effect of technology characteristics on user satisfaction among Abu Dhabi police department employees in UAE.

II. REVIEW OF PRIOR STUDIES

A. System Quality (SYSQ)
SYSQ can be described as suitability, reliability, and stability of the information system in terms of both software and hardware [6]. The system's feature include ease of use, functionality, flexibility, understandable, and reliability [7]. It is formed in the process of interaction between the user and the system such as when completing a specific task [8]. The high level of user satisfaction and internet use is highly related to the high level of system performance [9-11]. Additionally, it is mentioned that system quality is also determined by bugs and uniform functioning of the system.

System quality has been the focus of most IS researchers around the world ever since its inception in the information system success model proposed by Delone & Mclean [6]. Many types of research have been done on the role of system quality in many technology applications all over the world. In the knowledge management systems context, two studies in Taiwan and Malaysia by Wang & Lai [12] and Cham and others. [13] respectively, have found that system quality has a significant positive relationship with usage, and user satisfaction. In a similar outcome to another study in Saudi Arabia in the context of e-learning, the findings were reported as the same as prior studies [14]. Moreover, in the context of internet technology, a study in turkey reported the significance of the relationship between system quality and user satisfaction [15,16]. Hence, the below mentioned hypothesis is suggested for this study.

H1. System quality shows a significant influence on the satisfaction level of users.

B. Information Quality (INFQ)
INFQ is referred to as the characteristics of system output as being accurate, up-to-date, and complete [7], besides relevance, understanding, and accessibility as other characteristics of information quality as described by Tam & Oliveira [17]. Besides, the quality of information replaces the quality of knowledge gained in terms of e-learning [18]. Some others also described the instructional elements shared from teachers to their students as information quality. Additionally, other researchers in the internet context have described information quality as being well organized, effectively presented, and useful [19].

Various analytical studies have investigated the role of information technology in different applications and different contexts, for instance, a recent study by [15] in Turkey to study the impact of information quality on the satisfaction rate of users and deduced a significant correlation in between them. Hence, the below mentioned hypothesis is suggested:

H2. INFQ influences user satisfaction in a positive manner.

C. Service Quality (SERQ)
SERQ can be defined as the accomplishment in the delivering the service in accordance with the customer's need and contentment [20]. In the context of IS research, Delone & McLean [6] have referred to SERQ

through varied attributes namely tangibles, reliability, responsiveness, assurance, and empathy in their proposed and updated model of information system success. Whereas, Petter & McLean [7] suggested that service quality represents the support of users by the IS department, and is often measured by the responsiveness, reliability, and empathy. Nevertheless, service quality in the internet context encompasses both the responsiveness of the instructor and the technical support provided by the university as illustrated by Freeze and others. [21].

Service quality is the third factor in the overall quality construct. Beside system and information quality, it has been the focus of research in the IS arena all over the world since its inception in Delone & Mclean information system success model and its update in 2003 [22]. With the growing number of technology applications with sophisticated and creative functionalities, service quality becomes an indispensable factor for the success of any technology application specifically for internet which the core of this research is. According to studies, service quality is significantly positively related to user satisfaction. Hence, the hypothesis herein is

H3. Service quality significantly has a positive impact on user satisfaction.

D. User Satisfaction (SAT)
SAT is defined as one of the most important features of the Delone & Mclean Model [6]. Therefore, it has extensively been used to study the use of technology systems and applications. User satisfaction is a manifestation of the attitude of someone towards certain computer application who is directly interacting with, whereas Almarashdeh described it as the degree to which users think a specific system or application fulfills their informational requirements [16]. Moreover, user satisfaction refers to the perception that is based on whether the users understand the system's worth and is in need of it.

III. RESEARCH METHOD

A. Proposed Research Model
The current research work uses the Delone & Mclean model and the conceptual framework that hypothesizes the relationship between the construct variables (as mentioned in Fig. 2. The proposed model assesses the relationship between the mentioned constructs among Abu Dhabi police department employees in the United Arab Emirates. The proposed conceptual framework has three hypotheses to be tested.
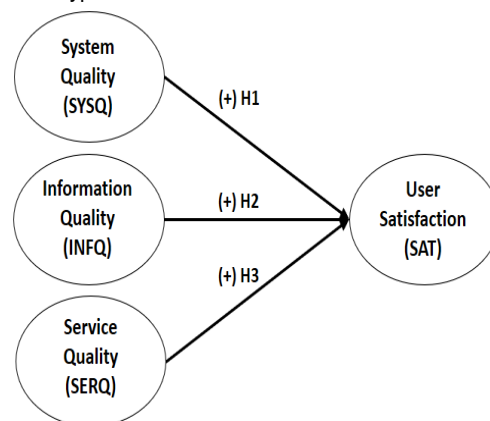

Fig. 2. The proposed model.

B. Instrument Development

Constructs were calculated by using a Likert scale [23]. Prior research works were referred to crosscheck the study parameters (Appendix A). In this study, the each construct particulars were calculated by using the guiding principles followed in the study conducted by Hayduk & Littvay [24].

C. Sampling of Data

The information was collected by delivering a self-administered questionnaire 'in-person' from October 2017 until March 2018 to government employees. Out of total 700 distributed survey questionnaire sheets, 448 sheets were collected with responses and 406 sheets were filtered out to be used in this study. Compared to the relevant literature the 60.43% response rate of this study is considered very good [25]. The number of the deleted questionnaires was 42 including a 25 missing data cases of more than 15% of the questions, and 6 cases as outliers, and 11 cases that have a straight lining.

IV. STUDY OF DATA AND ITS FINDINGS

The research model of the current study was assessed by using PLS SEM-VB and SmartPLS 3.0 software [26]. The elaborative evaluation led to the implementation of a two-step of analytical methodology, i.e. structural (to test the relationship hypotheses) and measurement (to test the validity and reliability) models of assessment [27,28]. This two-step analysis model is superior in comparison to the one-step assessment methodology [29,30]. The first model measures the parameters of the structural model, whereas the later one records each constructs measurement [28].

PLS technique is utilized in the current study for its analytical skills to deduce clear evaluations [31].

A. Measurement Model Assessment

Construct reliability and validity (consisting of convergent and discriminant validity) were utilized to test the measurement model. The reliability of each core variable in the measurement model (construct reliability) was evaluated by using the individual Cronbach's alpha coefficients. The values of all the individual Cronbach's alpha coefficients in this study were between 0.886 to 0.911, which exceeded the suggested value of 0.7 [32]. The composite reliability (CR) values were between 0.929 to 0.944, which exceeded 0.7 [33-35]. Thus, construct reliability is satisfied as Cronbach's Alpha and is found to be error-free for all constructs (Table 1).

The factor loadings aided in analyzing the Indicator Reliability. According to Hair and others. [30], values exceeding 0.50 indicate significant factor loadings (Table 1).

AVE was assess to analyze the Convergent Validity. It is reported that this validity shows a positive correlation with the alternate values of the same variables. The AVE values range within 0.818 to 0.849 that is more than 0.50[30]. The convergent validity has been achieved by all the construct variables in this study (Table 1).

Table 1: Assessment of measurement.

Constructs	Item	Loading (> 0.5)	M	SD	α (> 0.7)	CR (> 0.7)	AVE (> 0.5)
System Quality (SYSQ)	SYSQ1 SYSQ2 SYSQ3	0.888 0.912 0.914	3.05	1.10	0.889	0.931	0.818
Information Quality (INFQ)	INFQ1 INFQ2 INFQ3	0.919 0.915 0.892	3.09	1.16	0.895	0.934	0.826
Service Quality (SERQ)	SERQ1 SERQ2 SERQ3	0.923 0.910 0.931	3.16	1.21	0.911	0.944	0.849
User Satisfaction (SAT)	SAT1 SAT2 SAT3	0.898 0.903 0.906	3.14	1.14	0.886	0.929	0.814

Note: AVE = Average Variance Extracted, CR = Composite Reliability, α= Cronbach's alpha, SD=Standard Deviation, M=Mean.

Table 2: Validity via cross-loadings.

	SYSQ	INFQ	SERQ	SAT
SYSQ1	**0.888**	0.513	0.486	0.556
SYSQ2	**0.912**	0.538	0.551	0.562
SYSQ3	**0.914**	0.565	0.564	0.569
INFQ1	0.552	**0.919**	0.623	0.565
INFQ2	0.553	**0.915**	0.690	0.556
INFQ3	0.518	**0.892**	0.671	0.525
SERQ1	0.544	0.675	**0.923**	0.560
SERQ2	0.557	0.696	**0.910**	0.533
SERQ3	0.530	0.636	**0.931**	0.523
SAT1	0.555	0.543	0.524	**0.898**
SAT2	0.563	0.540	0.518	**0.903**
SAT3	0.565	0.552	0.541	**0.906**

Discriminant validity, Heterotrait-monotrait ratio (HTMT), Fornell-Larcker, and Cross-loadings were applied to analyze the measurement model [36]. Usually, cross-loadings are used as the first step in testing discriminant validity of the indicators [30]. The cross loading parameters have satisfied all the requirements in the present study as denoted in Table 2.

The bold variables in the table denote the square root value of the AVE that is more than the corresponding values, indicating a strong correlation between the variables and their respective indicators (Table 3). The exogenous constructs showed a correlation value <0.85, and thus the better discriminatory validity is satisfied [30,37].

Table 3: Validity via Fornell-Larcker criterion.

	Factors	1	2	3	4
		INFQ	SERQ	SYSQ	SAT
1	INFQ	**0.909**			
2	SERQ	0.727	**0.921**		
3	SYSQ	0.595	0.590	**0.904**	
4	SAT	0.604	0.585	0.622	**0.902**

Note: The entire values represent the correlation between variables except the diagonal which represents the square root value of AVE

The Fornell-Larcker criterion has been subjected to debate. because it does not have the ability to determine precisely the lack of discriminant validity in normal research situations [38]. Therefore, another technique has been suggested, namely HTMT ratio in terms of multi-trait-multi-method matrix. The discriminant
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validity poses certain issues when the HTMT value is higher than the $HTMT_{0.90}$ value of 0.90 [39] or $HTMT_{0.85}$ value of 0.85 [34], but Table 4 shows that all the HTMT values were less than the 0.85 requiring the need to satisfy the validity.

Table 4: Validity via HTMT.

	Factors	1	2	3	4
		INFQ	SERQ	SYSQ	SAT
1	INFQ				
2	SERQ	0.806			
3	SYSQ	0.667	0.656		
4	SAT	0.678	0.651	0.701	

Key: SAT: user satisfaction, SERQ: service quality, INFQ: information quality, SYSQ: system quality

B. Structural Model Assessment
Beta (β), R^2, and the corresponding *t*-values were implemented through the bootstrapping mechanism of 5000 resamples to evaluate the structural model [28].

The analysis was made on the basis of the effect sizes (f^2) and the predictive relevance (Q^2) with p-value determining the presence of any effect. However, the effect size is not mentioned [40].
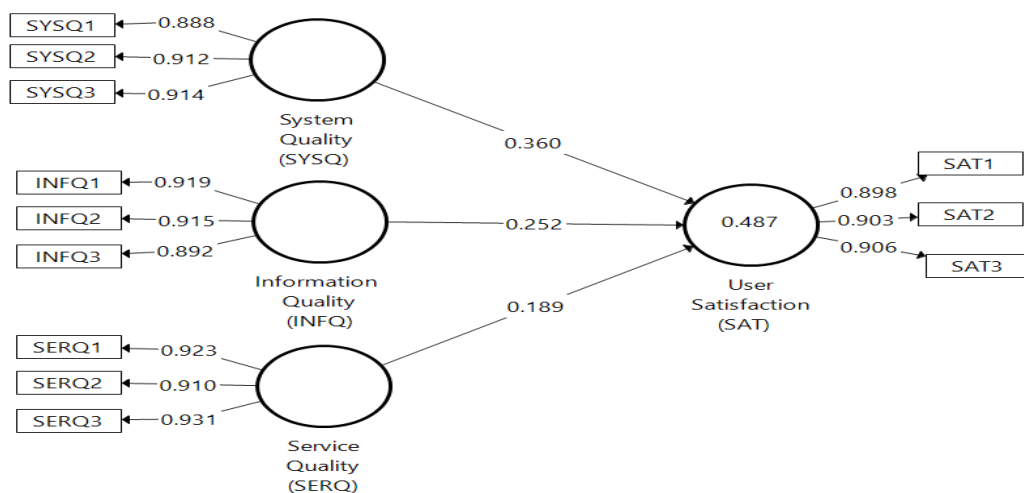

Fig. 3. PLS algorithm results.

Hypotheses Tests. The structural model in the current research supports all the three proposed hypotheses. Hence, H1, H2, and H3 are accepted with
($\beta = 0.360$, t=7.211, p<0.001),
($\beta = 0.252$, t=4.623, p<0.001), and
($\beta = 0.189$, t=3.653, p<0.001),
respectively.

The association between the exogenous and endogenous constructs is computed by using basic path co-efficient depicting the direct influence of system quality on user satisfaction. Nearly 49% of user satisfaction variance is described in terms of system, information, and service qualities. The values of R^2 have an acceptable level of explanatory power, indicating a substantial model [41,42].

'f^2' was analyzed and it determined the effect of the exogenous latent construct and assess the change in the R^2 values [28]. The f^2 value of 0.35 indicates large effects, 0.15 indicates medium effects, and 0.02 indicates small effects [41]. Table 5 displays the f^2 results, indicating two small effect sizes relationships and one medium effect size relationship.

The blindfolding procedure has been employed on the endogenous constructs of this study with a reflective measurement only, when predictive relevance (Q^2) value is more than 0 [28], thereby concluding in an adequate amount of predictive relevance (Table 5).

According to O'brien [43], the existence of multicollinearity poses a problem as it indicates overlapping of the variance that the exogenous constructs explain in the endogenous construct. Therefore, it cannot justify each variance in the endogenous variable. Variance inflation factor (VIF) is commonly used as a measurement of the degree of multicollinearity [43]. Values more than 10 for VIF denotes an issue, whereas the value more than just 5 denotes multicollinearity issues. Hence, there is no significant multicollinearity issue among the exogenous constructs. In other words, there is no overlapping of the variance that the exogenous constructs explained in the endogenous construct.

Importance-Performance Map Analysis (IPMA). IPMA was employed as a post-hoc PLS procedure in this study, with the user satisfaction used as the outcome construct. According to Hair and others [28], the IPMA provides an estimation of the total effects corresponding to the importance of previous constructs that influence the target construct (user satisfaction). The average values of the latent variables are in correspondence with their performances, however, those scores (Index values) are calculated by rearranging the scores from least to highest performance score (0 to 100). The PLS evaluation is enhanced by IMPA as it focuses on the average value of latent constructs and their indicators (performance) along with the coefficient analysis (importance) (Table 6).

Table 5: Assessment of structural model.

Hypothesis	Relationship	Std Beta	Std Error	t-value	p-value	Decision	R^2	f^2	Q^2	VIF
H1	SYSQ→SAT	0.360	0.050	7.211	0.000	Supported	0.49	0.150	0.366	1.687
H2	INFQ→ SAT	0.252	0.055	4.623	0.000	Supported		0.053		2.330
H3	SERQ→ SAT	0.189	0.052	3.653	0.000	Supported		0.030		2.308

Table 6: IPMA for user satisfaction

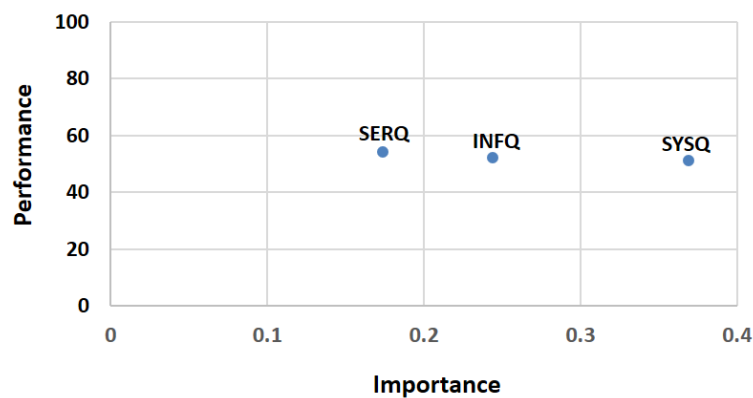| Latent constructs	Total effect of the construct *user satisfaction* (Importance)	Index values (Performance)
System Quality	0.369	51.175
Information Quality	0.244	52.319
Service Quality	0.174	54.036

Fig. 4. Priority Map (IPMA) for user satisfaction.

System quality is very crucial parameter that is essential to determine the user satisfaction for its increased importance value with respect to other constructs in the suggested model (Fig. 4). Although an obvious gap is existent in the factors influencing the satisfaction rate of the users, the factors exhibited similar scores of performance.

IPMA aims to identify the predecessors that have both relatively high importance (with strong total effect) and relatively low performance for the target construct (with low average latent variable scores) [28]. Particular attention may be given to the attributes of these constructs, which can be potential areas for improvement. Hence, the system quality performances should be enhanced by the managerial people to improvise the user satisfaction.

V. DISCUSSION

The proposed model supports that the current work enhances the understanding of the role played by technology characteristics (system, information, and service qualitites) in predicting user satisfaction among employees at Abu Dhabi police department in the United Arab Emirates, and brings the related repercussions.

System quality positively affects user satisfaction in using internet among employees at Abu Dhabi police department in the United Arab Emirates [17,44,45]. The more the employee finds internet to be easy to use, flexible, and have a clear and understandable interaction with it, the more they meet their expectations and thus are more satisfied considering themselves as more wise.

Likewise, it was also found that information quality positively affects the actual internet usage among the government employees sector in UAE [44,45]. Hence, the more the internet provides up-to-date, relevant, and accurate information, the more they meet their expectations and thus are more satisfied considering themselves as more wise.

Eventually, service quality reported the same findings [12, 15, 46, 47]. It is explained by the fact that the more the employee is able to use the internet at the time or place he/she wants, find task-related platforms, the more they meet their expectations and thus are more satisfied considering themselves as more wise.

VI. IMPLICATIONS, LIMITATIONS AND FUTURE DIRECTIONS

Leading governmental organizations should allow their employees to implement internet in their day-to-day professional activities for better result-oriented works and also can gain more experience out of it. It will in return help the governmental organizations to achieve their aims in a more strategically manner. Self-reported measures have been implemented in order to assess the model proposed in the current study. The privacy related problems led to failure is accumulating performance related data, thereby resulting in the downfall in the relevance of the study outcomes. As such, the findings should be taken with caution. There is need for an in-depth analysis to formulate a strategy to increase the internet user's performance and their count. Both qualitative and quantitative studies can be performed in this regard.

VII. CONCLUSION

In its pursuit of excellence, the United Arab Emirates government is trying its best to improve the productivity rate in its public organizations [48]. The current study outcomes can thus be helpful in this regard. The purpose of this article was to examine the impact of technology characteristics (system, information, and service quality) on user satisfaction among employees within Abu Dhabi police department in the United Arab Emirates.

APPENDIX
Appendix A

Instrument for variables.

Variable	Measure	Source
System Quality (SYSQ)	SYSQ1: I find the internet to be easy to use. SYSQ2: I find the internet to be flexible to interact with. SYSQ3: My interaction with the internet is clear and understandable.	[49-51]
Information Quality (INFQ)	INFQ1: The Internet provides up-to-date information. INFQ2: The Internet provides accurate information. INFQ3: The Internet provides relevant information.	[50, 52]
Service Quality (SERQ)	SERQ1: I could use the internet services at anytime, anywhere I want. SERQ2: The internet system offers multimedia (audio, video, and text) types of course content. SERQ3: The internet system enables interactive communication.	[53,54]
User Satisfaction (SAT)	SAT1: My decision to use the internet was a wise one. SAT2: The internet has met my expectations. SAT3: Overall, I am satisfied with the internet.	

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