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OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

The service quality and satisfaction of smart policing in the UAE

Maryam Ekaabi¹, Khalizani Khalid^{1*} and Ross Davidson¹

Abstract: The purpose of this paper is to investigate the multidimensional constructs of smart policing service quality, and the impact of these dimension on the satisfaction levels of UAE residents. An online survey was conducted using a sample of 230 respondents and analyzed using structural equation modeling. The findings of this study confirm that integrity and serviceability have a significant and positive impact on satisfaction. When hedonic dimensions are controlled, it was found that integrity, transparency, responsivity, interactivity, and serviceability are significant predictors of satisfaction. When utilitarian dimensions are controlled, only integrity, transparency, interactivity and serviceability are significant related to satisfaction. This study contributes to the policing and service quality research because limited studies demonstrate how smart policing service quality dimensions drive satisfaction. This research extends beyond current e-service quality models by addressing the importance of utilitarian dimension in police services quality. Such factors and their strategic relation to satisfaction are often overlooked in the public sector for the sake of maintaining long term relationships with residents; a sector in which users are believed to be mostly driven by hedonic motives.

Subjects: Business, Management and Accounting; Management of Technology; Innovation Management

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PUBLIC INTEREST STATEMENT

Smart policing is considered a core feature of smart-government service quality. Current studies have limited knowledge about utilitarian dimensions (integrity, and transparency), and hedonic dimensions (responsivity, interactivity, and serviceability) of police service quality and the impact of these dimension on the satisfaction levels of the UAE residents in the smart-technology context. Understanding the relationship is important because residents are the main beneficiaries of public services and are directly affected by government administration. The findings are robust even after controlling service quality primary dimensions of utilitarian and hedonic. Results suggest the importance of integrity and transparency to be embedded into the smart policing platforms in a citizen-centric government.

| **Keywords:** satisfaction; police service quality; smart policing; UAE

1. Introduction

Smart policing have enabled the police and public to access, use, and feed information through meaningful interaction, offering more personal experiences (Eterno et al., 2017). However, the robustness of smart policing service quality lies in its holistic capacity to benefit the public now and in the future (Accenture, 2013), ultimately leading to a high level of satisfaction (Carter & Grommon, 2017). The growth of smart policing is considered inevitable, despite residents' concerns over security and privacy, connectivity problems, and public anxiety over the threat of identity or information theft, lack of access, delays in response, and stifling bureaucracy (Osei-Kojo, 2017; Shin, 2017). In spite of these challenges, earlier studies have clearly demonstrated that electronic service quality brings improved flexibility and networking (Ahmad & Khalid, 2017). To satisfy the smart society, effective strategies are needed to highlight and promote the benefits (Anshari & Ariff Lim, 2017), and perceived values of smart policing services quality (Zauner et al., 2015). Policing service quality studies have clearly demonstrated that research has tended to focus mainly on factors which impact satisfaction, based on a service quality model (SERVQUAL) (Donnelly et al., 2006; Sarrico et al., 2013). However, it is important to examine smart policing service quality, an approach rarely observed in the policing literature. More specifically, it is important to consider the impact of smart policing service quality on satisfaction. To date, the impacts of smart policing service quality on levels of satisfaction has yet to be explored. This study seeks to fill this gap.

More specifically, the current study extends current research into satisfaction with e-service quality attributes. It focuses on the effectiveness of strategic resources in a smart policing context by asking the following research questions:

RQ1: What are the distinct dimensions of smart policing service quality as perceived by the public which may affect satisfaction?

RQ2: Which smart policing attributes most influence satisfaction?

This exploratory study aims to extend e-service quality models by incorporating a simplified model of interaction with the overall aim of improving the policing service quality experience of the public. This is accomplished by empirically investigating the impact of smart policing service quality (i.e. integrity, transparency, interactivity, responsivity, and serviceability) on satisfaction. The intention is to provide a better understanding of how the quality of smart policing made available through smart technology devices enhances the level of satisfaction. It is thereby hoped that this study will contribute to the policing literature while expanding the scope of service quality knowledge. The results of this research may also confirm the validity and applicability of the established framework for the evaluation of policing service quality. Most importantly, it is hoped that this study's findings will generate an initial mapping of United Arab Emirates (UAE) policing to identify unique demands, practices, organizing approaches, and policing needs, in comparison with policing issues in other countries. The results of this study may assist the police force and other law enforcement organizations in the UAE to develop strategies designed to better engage the public, serve them better, and enhance their confidence in smart policing services.

This paper consists of four sections. The first lays out the theoretical background, the main concepts to be studied and the hypotheses. The second section outlines the selected research and the data gives a rationale for the data collection process. The third presents the findings. The fourth and final section discusses the implications of these findings for experts in the field, managers, and policymakers and points out the study limitations while making suggestions for future research.

2. Literature review and research hypotheses

2.1. Service quality and satisfaction

Service quality has been widely discussed in the literature (Gupta, 2016; Zauner et al., 2015) and is commonly understood as a function of customers' expectations of the service to be provided

compared with their perceptions of the actual service experience (Grönroos, 1990; Zaithaml et al., 1993). In essence, service quality is the customer's overall reaction to the service of the relative organization (Parasuraman et al., 2005). Studies in the field of behavioral intention had linked service quality to satisfaction (Carter & Grommon, 2017; Mustelie-Puig et al., 2018). In government services markets, customer satisfaction is seen as a key driver of performance, making its evaluation and management crucial (Ahmad & Khalid, 2017). Satisfaction can, therefore, be described as a key construct for all aspects of relationships between two parties (Gupta, 2016) and is placed at the crux of any exchange-based relationship. Many authors concur that satisfaction stems from emotional experience derived from consumer past experiences (Gupta, 2016; Haryanto et al., 2017). For the purpose of this research, satisfaction is recognized as a cumulative construct: an effective customer condition which is properly derived from an evaluation of all conditions which relate to service quality, instead of a transaction-specific phenomenon (Bolton et al., 2018).

2.2. Smart policing service quality

It will be noted so far, that due to the absence of research within the context of smart policing, the literature review for this study draws mainly upon empirical studies conducted in different sectors and settings assessed service quality in smart technology contexts. Since previous studies proven security and reliability dimensions related to utilitarian value (e.g., Bauer et al., 2006; Sá et al., 2016), and users also consider interactive, responsiveness and accessibility as dimensions in hedonic values (e.g., Anshari & Ariff Lim, 2017; Loiacono et al., 2002), this study enriched the contribution by evaluating the impact of other utilitarian and hedonic dimensions because of their association with policing services in the smart context that rarely observed in the policing literature. For this reason, smart policing must satisfy both utilitarian and hedonic user values if it is to keep up with the value framework of community users (Accenture, 2013). Therefore, it is useful for measuring the extent to which utilitarian and hedonic dimensions are important and/or complementary for satisfaction. This study includes transparency and integrity as utilitarian dimension, and interactivity, responsivity, and serviceability as important hedonic dimensions because of their association with policing services and smart devices. It is widely agreed that utilitarian and hedonic factors positively impact smart policing (Donnelly et al., 2006; Kaptein & Reenen, 2001). This study, accordingly, believes that these dimensions can play a vital role in establishing a smart policing quality service framework. Five dimensions are described in the following sections, and each description is followed by hypotheses regarding their predicted impact on satisfaction.

2.3. Utilitarian dimension: Transparency

Transparency is described as the open flow of information (Kaptein & Reenen, 2001). Regarding smart services, this study defines transparency as truly open access to the availability of information to the public and clarity about the information. Transparency describes the trend for organizations to face more active demands for disclosure of information (Joshi, 2013). In the past, government entities had passively provided information only on request and could do so at their own discretion (Kim & Kim, 2016). Presently, they are required to engage in more active disclosure (Tyler et al., 2015). Furthermore, it has been argued that transparency serves as a strategy of accountability (Lum & Nagin, 2017). Citizens are now allowed to monitor the quality of public services and public employees are encouraged to satisfy society. The literature on transparency advises that organizations should be transparent in order to increase the degree of satisfaction (Jansen & Ølnes, 2016). Kaptein and Reenen (2001) stressed that transparency is expected to contribute positively to satisfaction by building credibility. Transaction transparency in a smart environment proves to be a critical predictor of satisfaction (Wu et al., 2017), especially in the public services sector (Janssen et al., 2017). This study, therefore, posits the following hypothesis:

H1: Transparency associated with the smart policing platform of the UAE police positively impacts satisfaction

2.4. Utilitarian dimension: Integrity

Karssing (2007, p. 3) defines integrity as professionals performing tasks adequately, carefully, and responsibly, while taking into consideration all relevant interests. This study considers a broader interpretation of integrity in the context of technology-enabled policing. Integrity can be viewed as an act (technology-assisted/or without) of compliance with the relevant moral issues and norms to regime values in service quality decision making and implementation processes in governance. While most studies consider integrity in service quality as similar between public and private service sectors, Van der Wal et al. (2006) argued that empirical research does not consider the distinct values of integrity between the public and private services sectors. Huberts (2018) expands this point by arguing that integrity is one of the central values of public sector ethics, while integrity in the private service sector often takes account of the environment in relation to corporate governance (Kaptein & Avelino, 2005). Integrity is also, naturally, an important feature of smart policing service quality which can have a significant effect on satisfaction relationships (Bouranta et al., 2015; Bullock, 2017; Lum & Nagin, 2017). In an examination of the integrity management of police in the Netherlands, Kaptein and Reenen (2001) concluded that integrity significantly impacts the satisfaction levels of society as a whole. Research also suggested that integrity also positively influences citizen satisfaction with police in India (Madan & Nalla, 2015), and in the USA (Hickman et al., 2016). Bouranta et al. (2015) observed that integrity in the policing system as an unique impact on levels of satisfaction among the public. Considering the existing literature, this study posits the following hypothesis:

H2: Integrity associated with the smart policing platform of the UAE police positively impacts satisfaction

2.5. Hedonic dimension: Interactivity

Interactivity is defined as the key feature of any police-public reciprocal activities through smart technology-enabled platforms (Elnaghi et al., 2018). In this study, interactivity refers to the ability of a provider to respond to user demands and consequently offer the typical social benefits derived from interacting with others via any smart technology or device. Public-police interaction represents a unique form of activities regarding action speed, information content, and highly sensitive types of information through a secure technology network (Mustelier-Puig et al., 2018). However, little research has been conducted in the area of smart policing with the inclusion of public-police interactivity (Lu et al., 2016). Interactivity, in this context, creates a form of social capital for police which can boost the quality-satisfaction relationship by enhancing the perceived benefits of long-term relations with smart policing (Bullock, 2017). Recent research points to the public-police capability of acting or influencing each other as an important factor of service quality; as interactivity enhances satisfaction with the use of smart technology (Ahmad & Khalid, 2017; Alsaadi et al., 2018). Other studies indicate also confirm that interactivity clarifies satisfaction towards police forces in a service quality context (Elnaghi et al., 2018). Overall, then, interactivity reflects positively on smart policing service quality and satisfaction relationships (Jiménez-Barreto & Campo-Martínez, 2018). The following hypothesis tests the connection between interactivity and satisfaction in smart policing service quality:

H3: Interactivity associated with the smart policing platform of the UAE police positively impacts satisfaction

2.6. Hedonic dimension: Responsivity

Candiello et al. (2012) established that responsivity means the quality of fast reaction in service activities. Consistent with Menezes et al. (2016), this study defines responsivity as swiftness and the agility to accommodate problem-solving in unanticipated situations; also referred to haste in troubleshooting problems. Bauer et al. (2006) found that responsivity increases usage due to the perceived quality of the service. Giovannini et al. (2015) substantiate responsivity as a dimension of smart service quality, especially regarding effective policing. However, others have argued that the impact of responsivity on

smart service quality has been under-researched (Candiello et al., 2012; Giovannini et al., 2015; Menezes et al., 2016). Parasuraman et al. (1988) indicated responsiveness is related to the readiness of services to perform quickly to meet customer expectation, which, naturally, increases satisfaction. However, this study argues that in the smart policing context, performing a service quickly does not necessarily correspond to satisfaction. Public-policing sequential activities are required to enable meaningful responsive actions to increase satisfaction. In an examination of the eGovernment services, Candiello et al. (2012) found that responsivity significantly impacted citizens' satisfaction. Police services should include responsivity into their service model to influence citizen's feeling and satisfaction (Dukes et al., 2009). In consideration of the existing literature, this study, therefore, posits the following hypothesis:

H4: Responsivity associated with the smart policing platform of the UAE police positively impacts satisfaction

2.7. Hedonic dimension: Serviceability

Yuen and Chan (2010) refer serviceability in terms of the ease of access to smart-based content and functions. Karjaluoto et al. (2018) described serviceability as a composite of the perceived usefulness and ease of use of content and function by the users of mobile devices. This study contends that serviceability is the degree of practicality and ease-of-use of a service's content and function with given resources and within a specified time in the smart-context. Earlier research suggesting that serviceability influences service quality and significantly impacts customer satisfaction (Yang, 2018). Arcand et al. (2017) found positively impacts customer satisfaction in mobile banking services. Service usefulness and ease-of-use clearly affected user satisfaction in the quality of the mobile augmented reality of South Korea cultural heritage tourism sites (Jung et al., 2018), and for mobile financial services apps in Finland (Karjaluoto et al., 2018). Easy access to smart-based content and function also positively impact and satisfy users (Wojdyski & Kalyanaraman, 2016). The following hypothesis, therefore, tests the connection between serviceability and satisfaction in smart policing:

H5: Serviceability associated with the smart policing platform of the UAE police positively impacts satisfaction

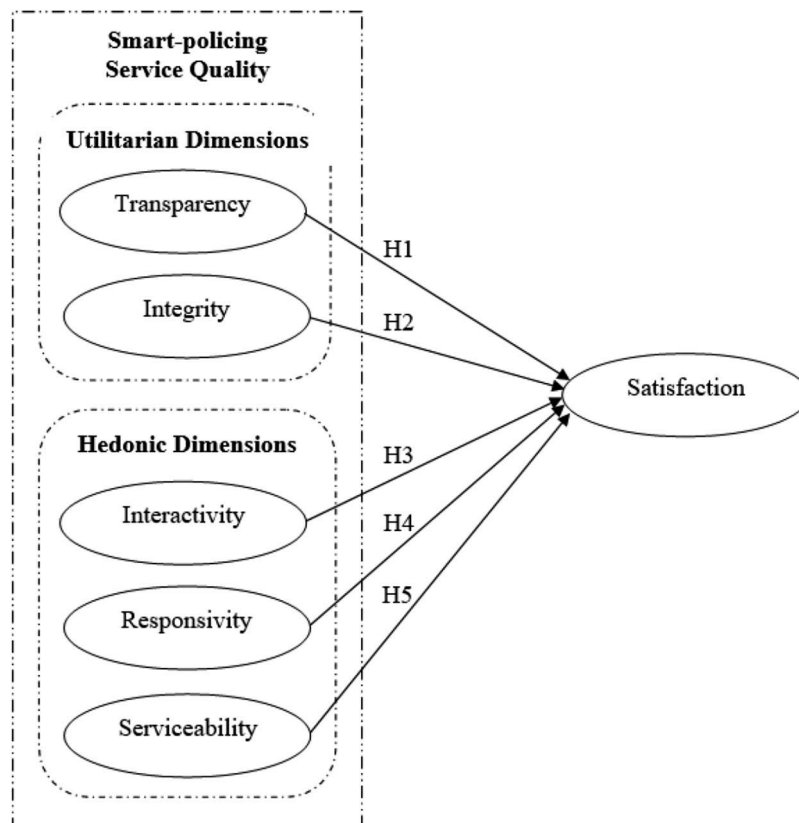
It can be recalled here that the main purpose of this research was to identify factors of service quality in the public's satisfaction with the current smart policing service provided by UAE police and to quantify the importance of these factors. Since only a limited amount of studies report directly on smart policing service quality from user perspectives, the literature from the fields of mobile commerce, banking, and the Internet was reviewed to establish a pool of constructs. The above review has shown that studies involving the police service largely use the established service quality model (Donnelly et al., 2006) and its extension to evaluate police service quality in terms of levels of satisfaction (Sarrico et al., 2013). However, it is clear that the current context of police service quality makes satisfaction more difficult to evaluate as the features of smart-services are different from one setting to another due to their unique features (Liang & Nguyen, 2017; Elsharnouby & Mahrous, 2015; Ganguli & Roy, 2010). While the concept of satisfaction may still be considered the overriding denominator of relationship quality, the current literature supports a more complex model, where the dimensions of smart policing service quality are interrelated. Figure 1 illustrates the model for this study and corresponding hypotheses.

3. Methodology

3.1. Participants

The sample of the study consists of users of smart policing in the UAE. The Ministry of Interior (MOI) of the United Arab Emirates (UAE) statistics show that, in 2015, there were 2.4 million smart policing users (Abu Dhabi Police, 2015) and, in 2018, 4.1 million smartphone users (Statista, 2018). 500 users of smart policing were randomly selected from 2.4 million users who were 18 years old and above, who had experienced using the smart policing applications provided by the Ministry of

Figure 1. The model and corresponding hypotheses.



Interior of the UAE using smartphones, or smart police kiosks, or smart police stations available across the UAE. The research was exploratory in nature and involved testing six constructs using structural equation modeling (SEM) (AMOS Version 18.0) (Arbuckle, 2006). Given the factors and the underlying assumptions of the appropriate sample size for SEM, a sample size of 400 smart policing users was considered appropriate for this study. Krejcie and Morgan (1970) recommended minimum sample size of 384 as appropriate for a population of one million and above.

3.2. Procedures

In order to understand the elements of service quality in the public-policing platform, a conceptual model was developed to measure the determinants of smart policing service quality of the UAE. A set of service quality dimensions specific to the smart policing service quality of the UAE was, accordingly, identified based on the literature review, focus group interviews, and attributes developed and used in previous research.

In the process of the focus group interviews, two mini focus group series were conducted for this study. Each group comprised eight participants of police officers, residents, professors, and government officials who were familiar with police affairs in the UAE. The group members were briefed and the purpose of the focus group interviews was explained. They were encouraged to discuss and list all of the factors that might influence their perceptions about expectations regarding the smart policing police service quality in the UAE. The outcome of the discussions was then summarized, inferences were drawn, and their opinions were categorized. A final list of 27 of utilitarian and hedonic aspects of police service quality attributes and five user satisfaction attributes was drawn up, based on dimensions frequently mentioned by participants. They were found to be broadly similar to past studies. In total, 32 attributes were retained as the study construct for this study. Table 1 summarizes the qualitative content, service quality dimensions from previous research and sources.

Table 1. Summary of the qualitative content, dimensions from previous research and sources

Constructs	Example of statements	Dimensions of previous research	Sources
Transparency	... updates the progress of the process in clear manner. ... services act fairly by providing clear and sufficient information. ... consistent and trustworthy of the services are superb.	Usefulness Reliability Warranty	Bauer et al. (2006), Kim and Kim (2016), Sá et al. (2016), Parasuraman et al. (2005), and Prasad and Sharma (2015)
Integrity	... feel secure while interacting and making transactions. ... always use these services because we know that we are safe and secured. ... relying a lot on this service because very accurate about their services and information.	Security Privacy Anonymity Credibility Trust Safety Empathy	Bauer et al. (2006), Chen et al. (2017), Kaptein and Avelino (2005), Kaptein and Reenen (2001), Lee and Lin (2005), Parasuraman et al. (2005), and Van Ryzin (2011).
Interactivity	... very important because it serve as a front-line service for public security and every time, I have experienced the service without any disruptions and the services were very fast and smooth. ... hassle-free and very fast services are very important for working mom like me. ... relying a lot on this service as we do not need to go through face to face dealing anymore due to time-constraint	Sociality Relevant Interactivity Interactive Efficiency	Elnaghi et al. (2018), Loiacono et al. (2002), Parasuraman et al. (2005), and Srinivasan et al. (2002)
Responsivity	... identification that allows easy identification of the services provided. ... the current services are more dependable because it responds very fast. ... we love a faster service that fits our busy life.	Ease of navigation Consistency Ease of access Responsiveness Response time Fulfillment	Bauer et al. (2006), Candiello et al. (2012), Giovannini et al. (2015), Menezes et al. (2016), and Parasuraman et al. (2005).
Serviceability	... travels at least 5 days a week. Therefore, if I faces any issue, I quickly use the service because of it is very helpful and reliable ... this service provides a live customer support anytime-anywhere, smartest way to satisfy everybody. ... the services are satisfying because it allows for multiple access using smart platforms.	Practicality Functionality Accessibility Ability to serve System availability	Jung et al. (2018), Karjaluoto et al. (2018), Parasuraman et al. (2005), and Yuen and Chan (2010).

Face validity was used to collect input from experts which enabled questionnaire refinement. Even though the constructs employed in this study are well-validated by previous research (e.g., (Elnaghi et al., 2018; Jansen & Ølnes, 2016; Karjaluoto et al., 2018; Menezes et al., 2016; Van Ryzin, 2011), a draft of the questionnaire was reviewed by experts to ensure the readability of the questionnaire from a user perspective. The pilot test was then conducted with ten smart policing users, five senior police officers, and three university professors, all of whom were experts in information technology and service management areas. It was revealed that the experts found the questionnaire to be simple, readable, and required little time to complete. As expected, they suggested minor changes which were effectually addressed and incorporated into the final edition of the e-questionnaire in order to better align and match the UAE smart policing context.

This study was approved by the Institute of Research Board of Ethical Review of the authors' institution and the MOI of the UAE. The participants were then recruited for the cross-sectional online survey. By the end of the fourth month, 230 sets of results were collected, accounting for a 58 percent response rate. The response rate met the minimum of the 30 percent threshold suggested by Frohlich (2002). Of 230 questionnaires, 17 invalid questionnaires were removed because of incompleteness. In all, 213 useable questionnaires remained for statistical analysis. This study sample was made up of both males (50.7 percent), and females (49.3 percent) and 62.9 percent of the respondents were between 24 and 35 years of age. The overall sample profile was, in effect, fairly representative of the smart policing services users in the UAE.

3.3. Measurement of construct

To maximize the content validity of the measures, the e-service quality-related constructs developed and validated by previous research were employed and adapted to the content and context of this study. The constructs used in an online and a mobile context were mostly employed and adapted to a smart environment. The level of service quality perception was measured by in terms of the utilitarian and hedonic aspects of smart policing. The utilitarian aspect of smart policing service quality was measured using the dimensions of transparency and integrity. The hedonic aspect of smart policing service quality was measured using the dimensions of interactivity and serviceability. The list of 27 attributes measures user perception as a degree of understanding and perceptions based on a seven-point Likert scale ranging from (1) "very poor" to (7) "very good". The five attributes of satisfaction measured the degree of smart policing service quality meeting user expectations, ranging from (1) "strongly disagree" to (7) "strongly agree".

Satisfaction with smart policing was assessed using five items adapted from Cronin et al. (2000), C. Liang and Chen (2009), and Vatanasombut et al. (2008). Topical literature on e-service quality and mobile-service quality was employed and adapted to a smart policing service quality scale. Transparency was assessed using four items adapted from Kim and Kim (2016), Prasad and Sharma (2015), and Sá et al. (2016). Integrity was assessed using five items adapted from Kaptein and Avelino (2005), Kaptein and Reenen (2001), and Van Ryzin (2011). Interactivity was assessed using six items adapted from Elnaghi et al. (2018), Loiacono et al. (2002), and Srinivasan et al. (2002). Responsivity was assessed using six items adapted from Candiello et al. (2012), Giovannini et al. (2015), Menezes et al. (2016), and Parasuraman et al. (2005). Lastly, serviceability was assessed using six items adapted from Jung et al. (2018), Karjaluoto et al. (2018), Parasuraman et al. (2005), and Yuen and Chan (2010).

3.4. Analysis

The data were analyzed at two primary levels: measurement and structural models following the suggestion by Anderson and Gerbing (1998). Firstly, the measurement model involved two-legged stages which were based on content validity grounded on previous studies and theory. The first stage of the measurement model tested the convergent validity and model fit of a construct. Convergent validity measures the scales which measure a construct using an average variance extracted (AVE) test, factor loadings, and a reliability test (Kline, 2010). An AVE of higher than 0.5 (Fornell & Larcker, 1981), factor loadings of 0.5 or higher (Hair et al., 2010), and reliability value of

at least 0.7 (Raykov, 1998) indicated a high convergent validity. The test of model fit for this study used at least four fit indices (Kline, 2010); in which less than 5.0 for CMIN/DF (Bentler, 1990), more than 0.9 for CFI (Kline, 2010), more than 0.9 for TLI (Hu & Bentler, 1999), and less than 0.08 for RMSEA (Byrne, 2010). The second stage of the measurement model tested the discriminant validity, model fit, and multivariate normality of the constructs. Discriminant validity measures the distinction between constructs by comparing any AVEs higher than 0.5 against the square root of the respective correlation (Fornell & Larcker, 1981). Similar to the model fit test in the first stage, CMIN/DF, CFI, TLI, and RMSEA were used to test the multivariate model fit. Finally, the assessment of normality was conducted using skewness between ± 2 (Gravetter & Wallnau, 2014), and kurtosis between ± 7 (Byrne, 2010). The total disaggregation model was tested using SEM to analyze the standardization of the cause and effect hypothesis model.

4. Results

4.1. Common method bias

A Harman one-factor test was conducted to address the issue of common method variance due to the self-reported data used for this study (Podsakoff et al., 2012). The result suggested that no occurrence of common method effects observed in this study because none of the factors yields more than 50 percent of the variance, the Keiser-Meyer-Olkin measure of sampling adequacy (KMO) was at 0.971 and Bartlett's test of Sphericity was $\chi^2[496] = 8513.007$, $p < 0.001$. The KMO for the dimensions were between 0.881 and 0.931, indicating the appropriateness of factor analysis and suggesting that it was suitable to maintain the arranged items in each factor for the following analysis.

4.2. Measurement model

After data collection and data cleaning, the convergent validity of the studied constructs was tested for model fit and calculated using AVE, Cronbach's alpha (α), and composite reliability (CR) based on the factor loadings of each construct. Table 2 represents the details of the values for each construct. All items had more than 0.5-factor loadings, AVEs were well over 0.5, and α and CR values were more than 0.7. Table 3 depicts the model fit of each construct. All constructs showed a satisfactory fit with CMIN/DF less than 5.0, CFI and TLI well above 0.9 and RMSEA less than 0.08. The measurement model was also found to satisfactorily fit ($\chi^2[446] = 2.233$, $p < 0.001$, CFI = 0.935, TLI = 0.928, RMSEA = 0.076), and therefore the proposed model fitted the data well.

The AVEs were found to be greater than r-square for all associations. The data of the study was also considered normal because skewness was ± 2 , and kurtosis was ± 7 . All five smart policing service quality variables were positively inter-correlated (r s between 0.807 and 0.900, $ps < 0.01$). User satisfaction correlated positively to overall smart policing service quality variables (r s between 0.783 and 0.858, $ps < 0.01$). Moreover, the utilitarian dimensions: integrity and transparency related positively ($r = 0.898$, $p < 0.01$). With regards to hedonic dimensions: interactivity, responsiveness, and serviceability, each was related positively (r s between 0.807 and 0.861, $ps < 0.01$). These findings provide preliminary support for the proposed hypotheses.

4.3. Hypothesis testing

Table 2 shows the results of three regression analyses predicting user satisfaction. Consistent with the customer value framework, it is clear that smart policing services must satisfy both the utilitarian aspect (integrity and transparency) (Meijer et al., 2015), and the hedonic aspect (interactivity, responsiveness, and serviceability) (Moon et al., 2017) of police services which relate to smart-technology. This helps to answer the question of whether utilitarian dimensions and/or hedonic dimensions are important and/or complementary to ensuring the satisfaction of users. Firstly, in Model 1, all of the constructs were freely estimated in terms of their relation to satisfaction. Secondly, in Model 2, the controlled hedonic dimensions and utilitarian dimensions were freely estimated in terms of their relationship between smart policing service quality and user satisfaction. Thirdly, in Model 3, the controlled utilitarian dimensions and social dimensions were freely

Table 2. Convergent validities of measures

Dimensions	Code	Factor loadings	KMO	Eigenvalue	Variance explained (%)	AVE	Alpha (α)	CR
User satisfaction	SF1	0.820	0.903	4.013	80.266	0.756	0.868	0.939
	SF2	0.892						
	SF3	0.792						
	SF4	0.914						
	SF5	0.922						
Integrity	IG1	0.931	0.894	4.276	85.521	0.811	0.900	0.955
	IG2	0.940						
	IG3	0.924						
	IG4	0.856						
	IG5	0.847						
Transparency	T1	0.847	0.881	3.623	90.577	0.725	0.851	0.913
	T2	0.898						
	T3	0.859						
	T4	0.798						
	I1	0.861						
Interactivity	I2	0.878	0.915	4.816	80.271	0.754	0.868	0.948
	I3	0.904						
	I4	0.874						
	I5	0.843						
	I6	0.848						
Responsivity	R1	0.841	0.926	4.749	79.142	0.750	0.866	0.947
	R2	0.864						
	R3	0.848						
	R4	0.906						

(Continued)

Table 2. (Continued)

Dimensions	Code	Factor loadings	KMO	Eigenvalue	Variance explained (%)	AVE	Alpha (α)	CR
	R5	0.87						
	R6	0.865						
Serviceability	S1	0.873	0.931	4.855	80.924	0.771	0.878	0.953
	S2	0.887						
	S3	0.876						
	S4	0.888						
	S5	0.855						
	S6	0.889						

Table 3. Discriminant validities of measures

Construct	1	2	3	4	5	6
1						
User satisfaction	0.756					
2						
Integrity	0.844**	0.811				
3						
Transparency	0.857**	0.898**	0.725			
4						
Interactivity	0.850**	0.900**	0.837**	0.754		
5						
Responsivity	0.858**	0.874**	0.842**	0.861**	0.750	
6						
Serviceability	0.783**	0.900**	0.839**	0.834**	0.807**	0.771
Model fit indices						
CMIN/df	1.398	1.872	0.440	2.137	2.248	2.046
CFI	0.998	0.999	1.000	0.993	0.990	0.992
TLI	0.996	0.993	1.000	0.986	0.983	0.987
RMSEA	0.043	0.064	0.000	0.073	0.078	0.070
Skewness	1.206	1.164	1.008	1.214	1.243	1.330
Kurtosis	0.920	0.888	0.652	1.050	1.262	1.505

Note: ** correlation is significant at the 0.01 level; AVE appears on the diagonal (**bold and italic**) and the correlation is below the diagonal.

estimated in relation to satisfaction. The rationale behind this was that all of the smart policing service quality dimensions were distinctively intangible in nature. One study suggested that the user experience was often subjectively different between the technical and functional domains of service quality (i.e., the utilitarian and hedonic domains used in this study) due to the intangible nature of the user experience (Grönroos, 1991). Grönroos went on to say that technical quality is relatively objective and easy to measure in contrast to functional quality, which involves subjectivity needs and wants of users (Grönroos, 1984). For example, participants who are less satisfied with the smart policing utilitarian quality (i.e., technical) may be less likely to engage in the social aspects (i.e., functional) of smart policing services and vice versa (Franco et al., 2016; Myeong et al., 2014).

As shown in Table 4, (Model 1) integrity ($\beta = 0.414$, $p < 0.01$), responsiveness ($\beta = 0.233$, $p < 0.10$), and serviceability ($\beta = 0.688$, $p < 0.05$) were positively and significantly related to user satisfaction of smart policing applications service quality. In contrast, transparency ($\beta = 0.414$, $p > 0.10$) and interactivity ($\beta = 0.414$, $p > 0.10$) were insignificantly related to user satisfaction. Hypothesis 1 was, therefore, partially supported. As the five smart policing service quality variables were highly positively correlated (r s between 0.807 and 0.900, p s < 0.01 ; see Table 3), a multicollinearity test was conducted to inspect the variance inflation factors (VIF). This is consistent with Cohen et al. (2003), who suggested that a standard error of a regression coefficient for a given independent variable can be inflated as a result of correlations between independent variables. For this study, the test was between the smart policing service quality variables; integrity, transparency, interactivity, responsiveness, and serviceability. The VIF values for the five smart policing service quality variables ranged from 2.8 for responsiveness to 3.5 for integrity. This result suggested that multicollinearity was not a concern because VIFs values were below than the maximum level of 10.0 (Hair et al., 2010). However, it is recommended that this result is interpreted with caution because the standard errors were somewhat inflated. Overall, Model 1 was a satisfactory fit ($\chi^2/df = 2.212$, $p < 0.001$, CFI = 0.937, TLI = 0.929, RMSEA = 0.076), and explained 85 percent of the variance in user satisfaction with the quality of smart policing application services.

Hypothesis 2 stated that the utilitarian dimensions of quality related better to user satisfaction when the hedonic dimensions of smart policing services were controlled. Table 4 (Model 2) showed that the model was a satisfactory fit ($\chi^2/df = 2.229$, $p < 0.001$, CFI = 0.936, TLI = 0.929,

Table 4. Results of regression analyses predicting user satisfaction

		Hedonic dimensions ^a	Utilitarian dimensions ^a
	Model 1	Model 2	Model 3
Utilitarian dimensions			
Integrity	0.477**	1.628***	1.175*** ^a
Transparency	0.679	3.932***	1.091*** ^a
Hedonic dimensions			
Interactivity	0.235	1.105*** ^a	0.748**
Responsivity	0.376	1.101*** ^a	0.326
Serviceability	0.998*	1.116*** ^a	2.342***
R-square	0.85	0.88	0.82
CMIN/df	2.212	2.229	2.295
CFI	0.937	0.936	0.932
TLI	0.929	0.929	0.924
RMSEA	0.076	0.076	0.078

Note: N = 213. Standardized regression coefficients (β) are shown; ^a is controlled variable; significant at the * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

RMSEA = 0.076). In this model, integrity ($\beta = 1.628$, $p < 0.01$), and transparency ($\beta = 3.932$, $p < 0.01$) were related better to user satisfaction using smart policing applications service quality compared to Model 1, where all of the utilitarian values and social aspects of smart policing services were freely estimated. Therefore, Hypothesis 2 was supported. The VIFs were, therefore, tested for multicollinearity because the beta values of the standardized regression coefficients were greater than 1.0. The VIF values in this analysis ranged from 5.0 for integrity to 7.9 for serviceability, less than the maximum VIF value of 10.0 (Hair et al., 2010). However, the VIF values also indicated possible inflated standard errors due to multicollinearity. Discretion, therefore, is advised in interpreting the findings for the five smart policing service quality variables. Therefore, it could be said that Model 2 accounted for 88 percent of the variance in user satisfaction with the quality of smart policing applications services.

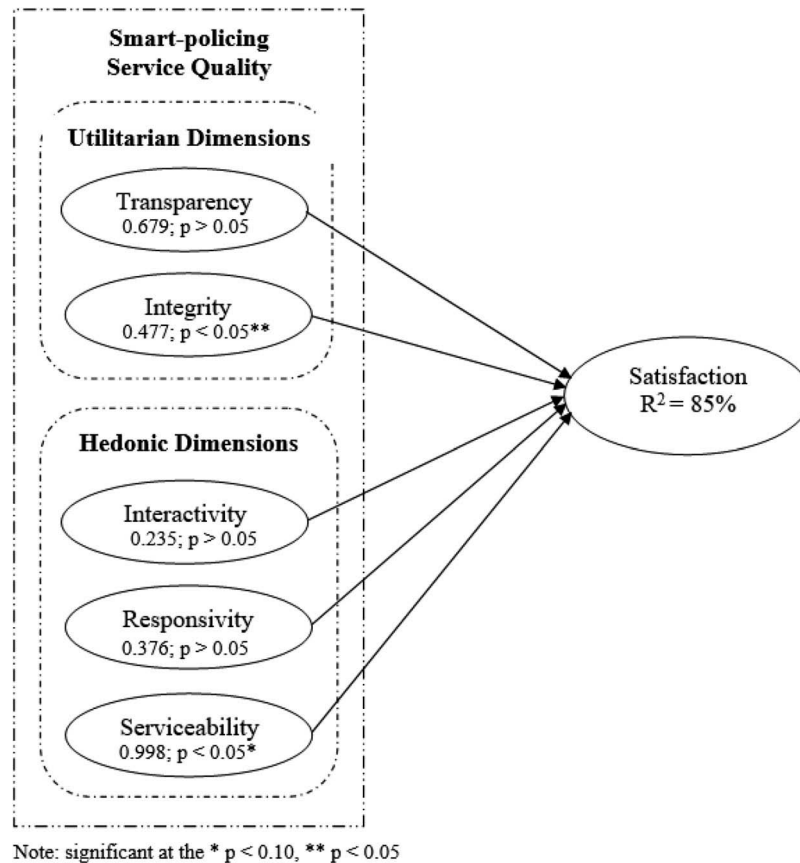
Finally, according to Hypothesis 3, user satisfaction can be improved when predicted by hedonic dimensions, while the utilitarian dimensions were controlled. For Model 3 (Table 4), only the hedonic dimensions of interactivity ($\beta = 0.748$, $p < 0.05$), and serviceability ($\beta = 2.342$, $p < 0.01$) were found to be positively and significantly related to user satisfaction, while responsiveness was insignificantly related to user satisfaction with the quality of smart policing application services ($\beta = 2.342$, $p > 0.05$; see Table 4, Model 3). This model also was satisfactory fit ($\chi^2/df = 2.295$, $p < 0.001$, CFI = 0.932, TLI = 0.924, RMSEA = 0.078). Therefore, Hypothesis 3 was partially supported. Based on Model 3, only the standardized regression coefficient of serviceability was improved when related to user satisfaction, while the standardized regression coefficient for interactivity was less than Model 2. Again, it is recommended that Model 3 is interpreted with caution because the VIF values of hedonic dimensions ranged from 4.1 for interactivity to 5.2 for serviceability. The VIF values of the multicollinearity test showed that there were no multicollinearity symptoms because the VIF values obtained were less than the maximum value of 10. Overall, Model 3 explained 82 percent of the variance in user satisfaction, much less than Model 1 and Model 2 on the quality of smart policing applications services. Results are presented in Figure 2 for Model 1, Figure 3 for Model 3, and Figure 4 for Model 3.

5. Discussion

This study examined how smart policing service quality dimensions influence user satisfaction. The findings concur with Grönroos (1991), who introduced the service quality concept based on the two basic dimensions of technical quality and functional quality: the corresponding terms utilitarian quality and hedonic quality were used in this study. Considered broadly, the findings provided support the argument that the utilitarian quality of smart policing in the UAE influences user satisfaction when compared with the hedonic quality aspects of smart policing. This finding is consistent with Grönroos (1984), who asserted that it was much easy to measure technical quality due to its relative objectivity, in comparison with functional quality, which relies heavily on user perceptions of quality based on their varied experiences. Importantly, this finding shows that not all smart policing service quality dimensions are equally important in enhancing users satisfaction. In other words, the higher the perceived quality of utilitarian value domain offered by smart policing, the more favorable the perceived quality of the hedonic aspects of user satisfaction.

The study findings also support, to a large extent, the contention of earlier studies (e.g., Elnaghi et al., 2018; Karjaluo et al., 2018; Loiacono et al., 2002; Menezes et al., 2016; Parasuraman et al., 2005) which found that predominant dissatisfier factors were responsiveness, functionality, and availability (in this study responsiveness, interactivity, and serviceability were the corresponding terms used). Even though integrity and reliability (transparency in this study) were found to be the predominant dissatisfiers in recent studies (Badran, 2019; Joseph et al., 2019; Sun et al., 2019), interestingly it was evidenced in this study that integrity and transparency were the predominantly satisfying factors in smart policing service quality dimensions. Model 1 and Model 3 clearly evidence that integrity and serviceability were the dominant factors for users satisfaction. This trend was changed when hedonic quality aspects (Model 2) were constrained and integrity and transparency were found to be the predominant factors which influenced user satisfaction.

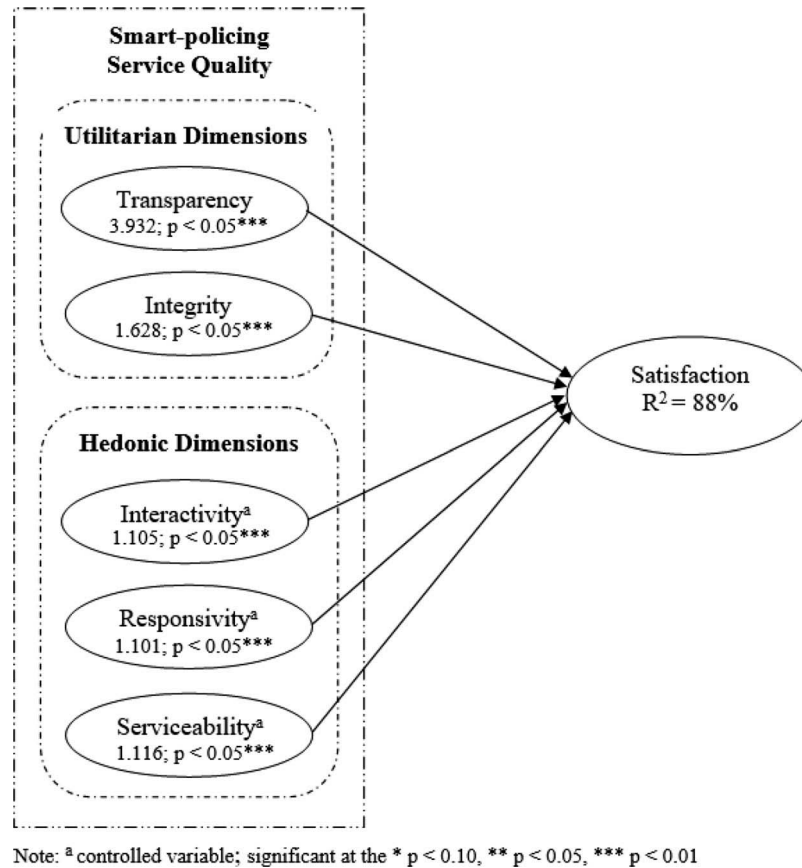
Figure 2. Result of Model 1.



Responsiveness was found to be the crucial source of satisfaction in another context; the Indian banking sector (Gupta, 2016), in contrast with the context of policing, as a public service, where it is clear that transparency is the most dominant factor impacting user satisfaction in the UAE. This result is consistent with a study conducted on the quality of government services in China, which found that transparency is considered the critical component of good governance; which points to hedonic quality values (Wu et al., 2017). Transparency was also reported to have had a positive impact on citizen satisfaction in a study conducted on Chinese public healthcare services (Yang, 2018). It can, therefore, be suggested that the classic framework of service quality and satisfaction which originated in the private sector is more robustly applicable to the public sector.

The lack of literature concerning the link between smart policing service quality domain of utilitarian dimensions and hedonic dimensions, in addition to studies of the dimensions of integrity, transparency, responsiveness, interactivity, and serviceability for user satisfaction, has already been indicated. In view of this lack, the findings of this study shed new light on the role of user evaluation beyond e-service quality (E-S-Qual) and the traditional service quality (SERVQUAL) attributes in formulating a usable way of measuring favorable or unfavorable users satisfaction toward smart policing. Even though responsiveness used in this study was similar to responsiveness dimension of E-S-Qual (Parasuraman et al., 2005), the dimensions used in this study offer a more robust operational definition, aligned with the dynamic changes related to next-generation smart technology. This is in line with Carter and Grommon (2017), who suggested that policing service quality is underdeveloped relative to other areas of the public sector. Limited research has also been observed on the citizen-centric nature of smart-technology service quality in the public sector (Candiello et al., 2012; Giovannini et al., 2015; Menezes et al., 2016). This study, therefore, contributes to the literature by exploring the field of smart policing service quality in an emerging

Figure 3. Result of Model 2.

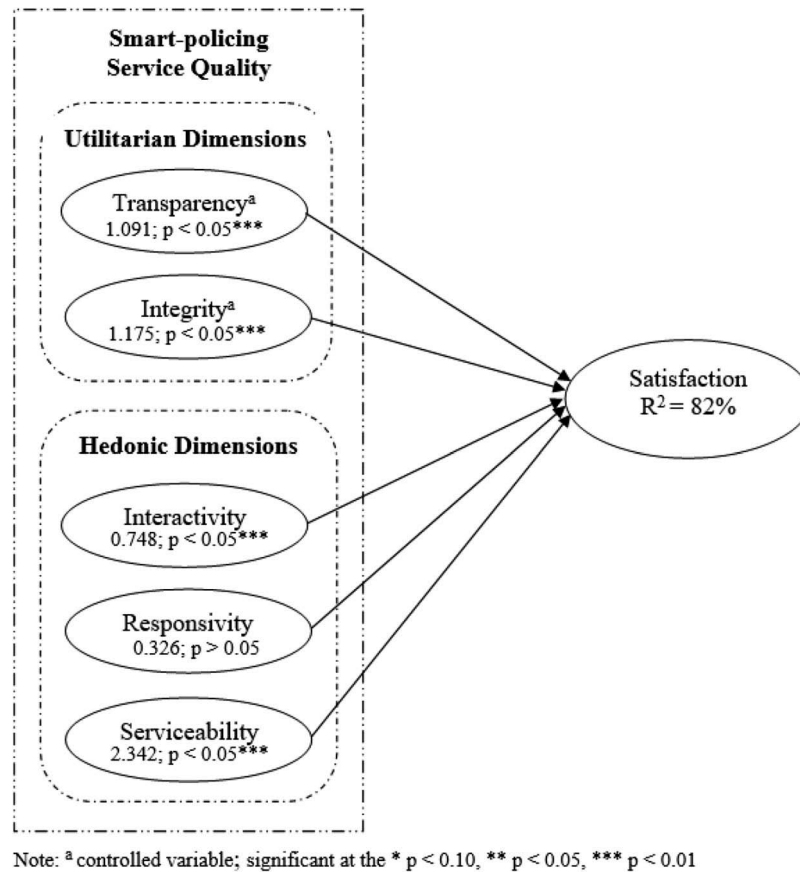


economy. In doing so, it reveals that a specific set of dimensions, which had previously only undergone limited research, are the most important dimensions to influence user satisfaction.

The findings are also consistent with information systems success models and offer further understanding of IS success models by explaining the relationship between service quality and user satisfaction (Delone & McLean, 1992). The findings also empirically support and confirm that the smart policing service quality, at least for the UAE, has a significant positive effect on user satisfaction. The results also reflect the limited research findings of technology-enabled police service quality (e.g., Carter & Grommon, 2017), mobile-government service quality (e.g., AlHubaishi et al., 2017; Ahmad & Khalid, 2017).

The conventional SERVQUAL dimension of responsiveness was found to be the significant dimension to influence user satisfaction in police service quality studies (e.g., Bouranta et al., 2015; Donnelly et al., 2006). It is surprising, however, to find contradicting causality results between responsiveness and user satisfaction in the smart policing service quality of this study (Model 1, $\beta = 0.376$, $p > 0.05$; Model 3, $\beta = 0.326$, $p > 0.05$). Indeed, these results contradict other research studies which concluded that responsiveness is the most important service quality predictor to user satisfaction (Wells & Millings, 2019; Yesberg & Bradford, 2018). Users were found to be skeptical in their resistance to the prospect of greater capability and ability of smart policing to mobilize, adjust, and stabilize policing operations at high speed in order to meet the perceived quality without undue delay. Since smart policing is relatively new in the UAE, psychological factors of users might significantly affect their value perceptions regarding police responsiveness. It is suggested that the user's situational preferences or constraints are expected to affect the user's concept of responsiveness in the relation between smart policing service quality and user satisfaction

Figure 4. Result of Model 3.



in the UAE. Yesberg and Bradford (2018) mentioned that fulfillment variability is the most important factor for any e-service platform to measure user satisfaction. Smart policing should evaluate the imprecise and uncertain psychological needs of users which naturally vary and are situational in nature. This effort will directly affect user satisfaction levels. The result of this study may be linked to the adaptation theory (Helson, 1964), which offers an understanding of the fact that expectations are not static and that any nonconformity from expected outcome fulfillment may affect disconfirmation experience. In other words, if user service quality expectations were not met, users may adjust their perceived discrepancy according to their satisfaction level. This notion is consistent with the suggestion that service quality expectation should be measured both before and after (Eriksson et al., 2018; Parasuraman et al., 1991) the service experience in order to ensure proactivity and take remedial actions for the sake of quality improvement and in order to meet the ever-changing expectations of users.

6. Conclusion

6.1. Implications

The finding of this study offer important theoretical and practical implications. As far as the authors are aware, this study is the first study which attempts to assess smart policing from an e-service quality perspective using measures that differ from SERQUAL (Parasuraman et al., 1991) and e-service quality (Parasuraman et al., 2005). This study, therefore, provides a foundation for further development of the constructs under focus. This study suggests conceptualizations of smart policing quality which need to be expanded through further research. As the nature of smart policing quality is, necessarily, citizen-centric for user satisfaction, it is recommended that

these construct should be redefined according to the increasing sophistication of devices, mobile applications, and network technologies; all of which are important to increase the smart platform visibility which is now strategically imperative for policing.

The theoretical concepts discussed in this study demonstrate the evolution of dual-service quality concepts for technical and functional qualities (Grönroos, 1984). However, from an empirical basis, the present study advances the argument that both utilitarian quality values and hedonic quality aspect domains replace the service quality concepts of technical and functional qualities, respectively, in order to match the citizen-centric context of smart policing. The importance of integrity and transparency in police services are thereby brought to the fore, along with other issues relating to the unique citizen-centric context. It is believed that this perspective is particularly important due to the inherent intangible nature of smart policing. In other words, smart policing services are, in this way, subject to evaluation in terms of the quality of experience of the users.

This study is also the first to introduce a theoretically well-grounded and relevant conceptualization of smart policing service quality dimensions. The instruments of integrity, transparency, interactivity, responsivity, and serviceability, as defined in this study, should offer direction for consequent investigations. By now being able to measure smart policing service quality, this proven scale can potentially inspire future research and advance understanding of smart policing service quality which extends beyond attitudes to technology and adoption of mobile capability (short-term); effectively assessing the impact of smart policing service quality on long term relationships. It is hoped that this measure will contribute to a dynamic theory of service management.

For a proper assessment of smart policing service quality, the instruments offered by this study should provide direction for subsequent investigations. Of course, it should be said that robust next-generation mobile networks and technology which offer higher user mobility, the internet of things, extreme real-time communication, ultra-reliable, and lifeline communication platforms, and broadcast-like services may ultimately be overwhelming and can cause disruption if managed poorly. As such, an IS success model (Delone & McLean, 1992) may offer an extended framework that relates directly to net system benefits. This model proposes that service quality, system quality, and information quality are the antecedents to usage intention and user satisfaction which directly affect net system benefits. As a result, the gap between robust next-generation mobile networks and technology and service quality can be bridged and further understood.

From a managerial perspective, the findings signal to managers in the public sector, particularly policing managers the importance of not underestimating the power of utilitarian factors (integrity, and transparency) when developing their smart policing platforms. These dimensions and their strategic relation to satisfaction are often overlooked in the public sector and are particularly important for maintaining long term relationships with residents, a sector in which users are believed to be mostly driven by hedonic motives. The model presented by the study is adequate and useable for public-sector organizational root case analysis. The smart policing service quality dimensions can be used to measure the expected-performance relationship of a public sector organization; offering information for further understanding of deficiencies, why quality or service deviations happen, and how to improve these deficiencies and deviations to improve customer satisfaction. Therefore, a more complex approach can be pursued based on dynamic domains to replace domains that may now be outdated and irrelevant due to dynamic changes in public sector organizations.

6.2. Limitations and future research directions

In spite of the above positive contributions, this study has a few limitations which need to be considered when interpreting the results. Firstly, this study is restricted to being a cross-sectional study of UAE smart policing user perspectives. The causality of the structural model cannot be fully

explored due to the multiple variabilities of a satisfaction level that was not accounted for in this study. The heterogeneity of the target respondents makes the satisfaction level more dispersed and, consequently, more difficult to measure objectively. It would be interesting to test this framework for the effects of gender, age group, nationality, and household income perspective to offer a further understanding of how variability in service quality expectations may affect the variability of user satisfaction levels. Secondly, the analysis of this study is restricted to the direct causality model which may be influenced by multiple within-group structures and parameters. Future research should consider evaluating multi-group analysis modeling to provide a further understanding of the stabilizing effect of the psychological compatibility of users in measuring the relationship between smart policing service quality on user satisfaction. The generation of a comparison study would, thereby, be possible. Thirdly, the fourth industrial revolution has revolutionized the UAE and the global landscape is marked by emerging technologies which are transforming the entire system of governance. In this scenario, it is suggested that future research measures the level of smart policing service quality across time and examines whether the variables in this study change at multiple stages of robust next-generation mobile network and technology. This is important because smart policing is still relatively new and represents an emerging trend in the context of the UAE. Fourthly, future studies should use the longitudinal method to predict the user satisfaction level of smart policing service quality over time, since the model in this study is cross-sectional, which only measures user satisfaction at a specific time frame and at a single point in time. Fifthly, this study can be complemented with the evaluation of the impact of the antecedent factors of smart policing service quality: the model of citizen's adoption and use of e-government proposed by Venkatesh et al. (2016) with the inclusion of experience and personal needs as additional moderating variables. Indeed, the combination of information technology models can provide a better understanding of how to support the IS success model theory. This may serve as a stepping stone for future inquiry into the emerging area of public sector service quality management.

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