IPRPD
International Journal of Business & Management Studies
ISSN 2694-1430 (Print), 2694-1449 (Online)
Volume 04; Issue no 10: October, 2023
DOI: 10.56734/ijbms.v4n10a3

MEASURING THE PSYCHOMETRIC PROPERTIES OF THE CUSTOMERS' EXPERIENCE WITH BANKING ELECTRONIC SERVICES DURING THE COVID-19 PANDEMIC

Sager Alharthi[1]

[1]*Business Administration Department, College of Administrative and Financial Sciences, Saudi Electronic University, Saudi Arabia*

Abstract

The use of banking electronic services (e-services) increased dramatically during the coronavirus disease (COVID-19) pandemic. This increase has been associated with failures, defects, and shortcomings in such services. Research on this topic is increasingly using different methodologies. The aim of this study was to examine the psychometric properties (i.e., reliability and validity) of a recently developed scale designed to measure customers' experiences with banking e-services in Saudi Arabia during the COVID-19 pandemic. This scale has been reported to have acceptable face and content validity. The quantitative research approach is applied and data is collected through a research survey. The scale's questionnaire has two parts: one part consists of items on demographic variables (e.g., age, gender, and experience of service failure) and the other of 75 items on topics such as perceived information quality, digital commitment, service satisfaction, and cultural impact on choice of e-banking services. A descriptive-explorative, cross-sectional research design was used in this study, which focused on Saudi banks and utilized a non-probability sample of 555 customers. The scale was subjected to normality testing and did not violate normal distribution assumptions. The scale also showed acceptable levels of sphericity, and the Q–Q plot showed a significant relationship among items, reflecting normal distribution of items. The scale's internal consistency value was 0.986. The results of a principal component analysis showed that all 75 items loaded above the cutoff point of 0.50 and could be subsumed under four factors: information processing and quality of services, perceived justice, security and safety, and e-services recovery and banking choices. The newly developed scale is valid and reliable for the target population and can be used to measure customers' experiences with banking e-services. Further testing is warranted to ensure the scale's suitability and stability over time and for other populations.

Keywords

Measuring Psychometric Properties, Customers' Experience, Banking E-Services, COVID-19 Pandemic, Saudi Arabia

Background

The use of banking electronic services (e-services) increased dramatically during the coronavirus disease (COVID-19) pandemic because of the lockdown measures implemented and the need to purchase essential items (Çolak & Öztekin, 2021). This increase created a challenging environment for banks in terms of their electronic infrastructure and preparedness (Kozack, 2021). Thus, banks adopted a wide range of e-services with the dual aims of providing necessary services to their existing customers and attracting new customers (Hess, 2008; Marcu, 2021). In Saudi Arabia, banks competed to provide customers with banking e-services and aimed to improve their experience and increase their commitment to the bank. However, it is likely that there were unexpected service failures and that not all customers had a good experience; in fact, some might even have had an unpleasant experience (Harun et al., 2019). While some studies have been conducted on this topic and published in the literature, limited studies on this topic have been conducted in Saudi Arabia (Jebarajakirthy & Shankar, 2021; Korzeb & Niedzio, 2020).

Providing banking e-services is now a necessity for all retailers worldwide, including those in the Saudi market. Kosiba et al. (2020) argued that the level of trust that customers have in retail banking, including e-services, has a significant impact on their engagement in the services provided. Therefore, banks must provide user-friendly, advanced, and high-quality banking e-services; otherwise, they will lose customers to other banks that provide more advanced e-services with fewer service failures (de Matos et al., 2013). Herington and Weaven

(2009) found that customer satisfaction with e-retail banking services in Australia was significantly associated with the personal needs of the customer, website organization, user-friendliness of the websites, and efficiency of the service. Chavda (2021) also reported limitations of banking e-services, including security and technology issues, inefficient processes when having a complex transaction, and the safety situations around ATMs.

Failure of banking e-services has been shown to influence the credibility of banking services and customer satisfaction (Keramati et al., 2018). It has also been shown that when customer trust declines (i.e., when there is a decline in confidence in the e-service provider or when the provider or overall service loses credibility), this results in a move away from these services (Bougoure et al., 2016; Shams et al., 2020; Stevens et al., 2018). According to Balaji et al. (2017) and Shankar and Jebarajakirthy (2019), satisfied customers are less likely to show sensitivity to cost and more likely to continue dealing with a business or utilizing a service, such as a banking e-service. Balaji et al. (2017) also showed that greater satisfaction results in a stronger bond with the service provider. In terms of the factors that influence a customer's decisions after they experience banking e-service failures, the following were found to be important: information quality, digital commitment, employee performance quality, justice, behavioral intentions, e-service recovery satisfaction, service satisfaction, safety, cultural impact on bank e-service choice, and perceived service recovery quality (Bressolles et al., 2014).

In 2023, Alharthi (2023) reported on the development and face and content validation of a research instrument for measuring customers' experiences with banking e-services in Saudi Arabia: the customer experience of banking e-services scale (CEBES). Before the CEBES can be considered a reliable research instrument and used by researchers in future studies, its internal consistency, reliability, and psychometric properties must be assessed, and this was the focus of this study.

We expect that the outcomes of this study will have both theoretical and practical implications. The development of the CEBES addresses an essential issue that was highlighted during the COVID-19 pandemic and is relevant to customers and banks around the world, including those in Saudi Arabia (Ozkan et al., 2020). Experts have indicated that when customers' experiences with banking e-services are being examined, it is essential to collect data that will help banks to increase customers' willingness to replace conventional services with e-services in their everyday practice (Alarifi & Husain, 2021; Balaji et al., 2017).

The Customer Experience of Banking E-Services Scale (CEBES)

The CEBES questionnaire has two parts (Alharthi, 2023). The first part is comprised of items on the following demographic variables of the customer: age, gender, education qualification, occupation, income, and experienced service failure. The second part contains 75 items that form the scale. The most frequent failures reported in the literature were used to form the CEBES subscales: perceived information quality, digital commitment, employee performance quality, justice, behavioral intentions, e-service recovery satisfaction, service satisfaction, safety, cultural impact on bank e-service choice, and perceived service recovery quality (Alharthi, 2023). Responses to the items are recorded on a scale ranging from strongly disagree (1) to strongly agree (5).

The CEBES was tested for face and content validity by experts in the field of banking e-services (Alharthi, 2023). The face validity components investigated were clarity and comprehension, appropriateness, and spelling. The average score for clarity and comprehension was 4.44/5.00, the average score for appropriateness was 4.52, and the average score for spelling was 4.52. The scale-level face validity index (S-FVI) was 4.49/5.00 (89%). Content validity was tested by assessing relevancy and essentiality. Both types of validity were assessed using a five-point scale. The scale-level content validity index was 4.51/5.00 (90.02%), the item-level content validity index (I-CVI) for relevancy was 4.55/5.00, and the I-CVI for essentiality was 4.46/5.00. According to the experts who participated in establishing the face and content validity of the CEBES, the instrument is valid and can be used to assess factors that affect customers' experiences with banking e-services in Saudi Arabia (Alharthi, 2023).

Methods

Design

A descriptive-explorative, cross-sectional research design was used in this study. The study was conducted in several Saudi banks. This design is often used in field studies conducted in natural settings. Although it provides the least control over variables, this type of design supports theory development or validation of a research scale, such as that tested in this study (Hunter et al., 2019).

A convenience non-probability sample of banking e-services customers was recruited. This inexpensive sampling method requires minimal effort to generate a large sample size, allows the target population to be easily reached, and was deemed appropriate for this study as banking e-service customers are not expected to spend much time completing a research study questionnaire (Simkus, 2022).

Sampling, Recruitment, and Settings

A total of 555 participants were recruited to conduct a principal component analysis (PCA), with the aim of reducing the number of questionnaire items. The study was conducted across Saudi Arabia, in 27 branches of seven different banks. Customers visiting the bank branches were asked to complete a structured questionnaire, and based

on their responses, those who had experienced a range of failures in banking e-services were invited to participate in this study. The researcher explained the study's purpose, procedure, and expected outcomes to increase the level of interest among the bank customers. The researcher also notified the potential participants that all information would be anonymous, would be used for research purposes only, and would not indicate the identity of the participants. Upon agreeing to participate, each participant was asked to sign a consent form that indicated their willingness to complete the study questionnaire, that all information would be used for research purposes only, and that the bank has the right to obtain the overall study results but not the results specifically related to its customers.

Data collection was performed using free applications, such as email programs, Telegram, and WhatsApp. The data collection method was based on each participant's preference.

Statistical Analysis

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 22 (SPSS@IBM). The central tendency and distribution of the CEBES scores were examined for normality using the Kolmogorov–Smirnov goodness of fit statistic. A PCA was performed to reduce the number of items and so that only items that made a significant contribution to the interpretation of the study construct were included (Tabachnick & Fidell, 2001). A cutoff point of .50 was used to reflect that an item made a considerable contribution. The internal consistency of the scale was calculated using Cronbach's alpha, which is used to assess research instruments that utilize Likert scales to assign values to responses (Taber, 2018).

Results

Participants' Demographic Characteristics

A total of 555 participants completed the study questionnaire. Most of the participants were male (76%, n = 422), and the majority were more than 35 years old (Table 1). In terms of education level, most of the participants held a bachelor's (51.9%, 288) or higher degree. More than half of the participants were employed (53.0%, n = 294), and 76.6% (n = 42) stated that they had a mid-level income. Most of the participants reported that they had more than 10 years' experience as a customer of their bank (87.2%, n = 484).

		n	%
Gender	Male	422	76.0
	Female	133	24.0
Age (years)	18–23	25	4.5
	24–35	36	6.5
	36–45	147	26.5
	46–55	182	32.8
	> 55	165	29.7
Highest degree or level of education completed	High school	75	13.5
	Diploma	41	7.4
	Bachelor's degree	288	51.9
	Master's degree	96	17.3
	Ph.D.	55	9.9
Employment status	Student	20	3.6
	Employed	294	53.0
	Self-employed	25	4.5
	Retired	211	38.0
	Homemaker	5	.9
Economic status	High income	70	12.6
	Middle income	425	76.6
	Low income	60	10.8
Experience as a customer of the bank (years)	< 5	30	5.4
	5–10	41	7.4
	> 10	484	87.2

Table 1. Participants' demographic characteristics (n = 555)

Reliability and Normality

Item and scale reliability are analyzed to determine whether newly established research instruments, such as the CEBES, are suitable for use. The scale's internal consistency value was found to be .986, and the values for the subscales ranged from .672 ("digital commitment" subscale) to .965 ("perceived justice" subscale) (Table 2). These values were deemed acceptable, and consequently the psychometric measurement—the PCA—was performed (Raykov & Marcoulides, 2019). The data were checked for outliers, and no outliers were found. Outliers can dominate the results of a PCA (Holland, 2019). Therefore, we concluded that it was acceptable to perform a PCA using the varimax rotation method.

	No. of items	Cronbach's alpha	Mean	SD
CEBES	75	.986	279.54	45.15
Perceived information quality	6	.874	23.04	4.09
Digital commitment	4	.672	15.42	2.23
Employee performance quality	5	.831	19.34	3.17
Perceived justice	17	.965	61.33	12.72
Behavioral intentions	3	.922	11.30	2.74
E-service recovery satisfaction	6	.920	21.92	4.40
Service satisfaction	5	.943	17.82	4.52
Safety	10	.916	39.29	5.94
Cultural impact on bank e-service choice	7	.854	27.85	3.77
Perceived service recovery quality	12	.960	42.26	8.18

Table 2. Cronbach's alpha coefficient values of the customer experience of banking e-services scale (CEBES) and its subscales

The Kaiser–Meyer–Olkin measure of sampling adequacy was .873, which indicated a good level of intercorrelation among the items (Table 3). The Bartlett's test of sphericity results showed that the correlations between the items were sufficient for performing factor analysis, with a χ^2 value of 61826.960 ($P < .001$).

Based on the above results, factor analysis was performed to reduce the number of items and leave only highly contributing (loading) items in the study questionnaire (Tabachnick & Fidell, 2001). The split-half reliability was assessed using Cronbach's alpha, and the values for parts 1 and 2 were .976 and .972, respectively. The correlation between the two parts was .893, and the Spearman-Brown coefficient was .943 for the unequal length of 37 and 38 items. In addition, the Guttman split-half coefficient was .939, indicating acceptable item correlation.

Kaiser–Meyer–Olkin measure of sampling adequacy			.873
Bartlett's test of sphericity	Approximate χ^2		61826.96
	df		2775
	Sig.		.000
Cronbach's alpha	Part 1	Value	.976
		No. of items	38
	Part 2	Value	.972
		No. of items	37
Correlation between forms			.893
Spearman-Brown coefficient	Unequal length		.943
Guttman split-half coefficient			.939

Table 3. The normality, correlation, and reliability results for the customer experience of banking e-services scale (CEBES)

The first 12 items explained 77.91% of the variance (Table 4). A Q–Q plot was generated (Figure 1) and showed that the CEBES scores formed a relatively straight line, indicating a normal distribution with no extreme values, with thin positive and negative skewness (skewness = .645, kurtosis = .182, Komolgrov–Smirnov = 0.054 [lower bound of true significance = 0.200]).

Component	Initial eigenvalue		
	Total	% of variance	Cumulative %
1	37.174	49.565	49.565
2	3.704	4.939	54.504
3	3.534	4.712	59.216
4	2.726	3.635	62.851
5	1.822	2.430	65.281
6	1.712	2.282	67.563
7	1.511	2.015	69.577
8	1.418	1.891	71.468
9	1.268	1.691	73.159
10	1.198	1.597	74.756
11	1.126	1.502	76.258
12	1.092	1.456	77.714
*Extraction method: principal component analysis			

Table 4. Factor analysis results and eigenvalues of the customer experience of banking e-services scale (CEBES) items*

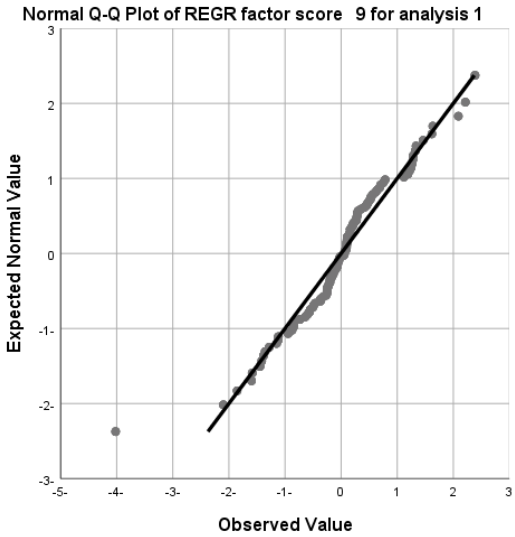

Figure 1. Q–Q plot for the customer experience of banking e-services scale (CEBES) scores (n = 555)

For the PCA, the varimax rotation method was used, which is an orthogonal rotation method that assumes that factors are not related (Brown, 2009). The PCA results showed that when the 75 items of the CEBES questionnaire were subsumed under four new factors (instead of 10), the cutoff point of .50 was exceeded in each case (Table 5). These factors were as follows: information processing and quality of service (15 items), perceived justice (17 items), security and safety (24 items), and e-service recovery and banking choices (19 items). The loading values of the questionnaire items ranged from .511 to .886.

	Item	Loading
	Information Processing and Quality of Service	
1	The online/phone bank's service personnel clearly understood my issue.	.545
2	The bank webpage is user-friendly.	.549
3	By following the instructions, the bank webpage is easy to follow.	.551
4	Information provided by the bank's webpage is relevant.	.648
5	Information provided by the bank's service personnel is accurate.	.743
6	The information provided is from trustworthy service personnel/web pages.	.757
7	The e-service quality of the bank has been appreciated by my friends.	.616
8	My prior experience with e-service recovery elsewhere has been good.	.715
9	Using e-services is enjoyable.	.658
10	The e-services provided by the bank were helpful.	.671
11	The service provider is polite and empathetic.	.638
12	The service provider listened attentively to understand my concern.	.655
13	The service provider could offer solutions to my problems.	.733
14	The service provider of the bank offered me an apology for the service failure.	.706
15	The service provider acts ethically and in good faith, providing true information to the customer (integrity).	.646
	Perceived Justice	
16	It is easy for me to complain.	.640
17	The process of reporting a complaint is clear to me.	.663
18	It took me a short period to submit my complaint.	.650
19	I believe the bank shows real interest in courteously treating me.	.824
20	I believe the bank will solve my issue quickly.	.768
21	I believe the bank would solve my issues with fairness.	.773
22	The follow-up in my case is acceptable.	.799
23	Professional personnel handled my case.	.787
24	The bank tries to be fair.	.770
25	The bank shows me the respect I deserve when asking for online/phone assistance.	.728
26	The bank works hard to resolve service failure.	.749
27	The bank follows my request and updates me frequently.	.763
28	The bank is ethical in dealing with me.	.783
29	The outcome I received is fair.	.863
30	The outcome I received is right.	.861

31	The bank treats me well.	.716
32	The bank's efforts resulted in a positive outcome for me.	.813
	Security and Safety	
33	If I had to choose a bank all over again, I would choose my current bank.	.725
34	I would highly recommend my bank to other people.	.772
35	I intend to continue using my bank.	.691
36	The recovery process is as per my expectations.	.799
37	The bank provides a timely resolution to my problem.	.805
38	The bank has a proper remedial mechanism in place.	.825
39	The recovery transaction process is safe and secure.	.753
40	The recovery e-services are simple.	.654
41	The recovery e-services are fast.	.723
42	My feelings about the bank are very positive.	.818
43	I feel good about doing business with this bank.	.818
44	I feel satisfied that the result of doing business with this bank is the best that can be achieved.	.882
45	The bank offers a quick review of my complaints/suggestions.	.794
46	The bank service personnel provide me with feedback on my complaints/suggestions.	.739
47	It is safe to open a new account via online services.	.636
48	My information is confidential when using online services.	.659
49	E-services are safe for running monetary transactions	.690
50	The bank e-services provide a good alternative to safe payments for my bills.	.579
51	My key information (e.g., password) is safe.	.670
52	My bank uses well-protected online services.	.614
53	My bank uses an authentication process when needed to protect my information.	.518
54	The backup of customer information is well-maintained for any emergency shutdown.	.519
55	Feedback on any bank transaction is sent to my email/phone immediately.	.637
56	I did not experience phishing during my e-banking.	.524
	E-Service Recovery and Banking Choices	
57	I have advice from a close friend/relative to use e-banking.	.706
58	My previous experience with bank e-services influenced my choice to use these services.	.651
59	My family used banking e-services even before the COVID-19 lockdown.	.568
60	The governmental support for e-service is significant.	.530
61	I pay all bills through the e-services of my bank.	.511
62	I buy things through my bank e-services with no issues.	.648
63	Bank reputation influenced my choice to use bank e-services.	.661
64	The bank personnel informed me about the process of service recovery.	.729
65	The bank personnel followed with me the service failure report.	.742
66	The bank asked about my satisfaction with the service failure follow-up process.	.733
67	Service recovery was speedy and timely.	.743
68	Service recovery was satisfactory to me.	.795
69	Service recovery actions by the bank personnel were prompted.	.718
70	Service recovery actions met my expectations.	.769
71	Service recovery mitigation steps were simple.	.713
72	Service recovery personnel displayed courtesy in their responses.	.695
73	Service recovery personnel were honest about the problem and the solution.	.768
74	Service recovery personnel offered appropriate compensation for the failure.	.673
75	The magnitude of service failure is limited in my bank.	.687

Table 5. Loading values of the 75 questionnaire items, which were subsumed under four factors

Hence, the PCA results indicated that the 75 questionnaire items of the CEBES had loading values above the cutoff point of .50 and could be subsumed under four factors.

Discussion

The aim of this study was to determine the validity and reliability of the CEBES in the Saudi context, and this aim was achieved. The CEBES was found to be valid and reliable in the Saudi context. In addition, a PCA was performed to determine the overall factors that best represent Saudi customers' perceived experiences with banking e-services. Four factors were identified, whereas the original CEBES uses 10 factors (Alharthi, 2023). This result could be explained by changes in the culture among bank customers, who are shifting toward seeing e-services as reasonable and acceptable alternatives to conventional banking services. This has certainly been the case during

and after the COVID-19 pandemic, which forced many people around the world to use e-services instead (Alarifi & Husain, 2021).

The four factors were as follows: information processing and quality of services, perceived justice, security and safety, and e-services and banking choices. These factors encompassed all 75 items of the CEBES. Normality, reliability, and validity were tested to identify the essential criteria that provide the scale with the statistical strength required for it to be used as a research instrument for measuring the intended concepts. The CEBES was found to be reliable when used on the current study sample, and the data set did not violate the criteria of normality.

The internal consistency of a scale is determined to examine the extent to which all the scale's items measure the same factor. In this case, the coefficient value for the CEBES was high (above .90). However, internal consistency values are not an adequate basis on which to judge reliability. The PCA involved assessing each item in a consistent manner to determine its contribution to the emerging themes (factors) that served the theoretically derived predictions of the research instrument (Joliffe & Cadima, 2916). The factorial analysis, selection of items of powerful representation, and setting of a statistically acceptable cutoff value were all performed to ensure that the psychometric properties and significant items contributed to the interpretation of the study construct.

The first factor, information processing and quality of services, included 15 items that addressed how bank officers and systems handled service failures and the quality of the experience with e-services (e.g., whether it was acceptable, enjoyable, and satisfactory). These elements of e-services have been emphasized in the literature (Harun et al., 2019; Rather et al., 2018; Shams et al., 2020). The 15 items had loading values between .545 and .757. The items contributing to this factor underscore the fact that customers who are satisfied with bank e-services are likely to continue using these services in the future (Rahi et al., 2022).

The second factor, perceived justice, included 17 items. The loading value of these items ranged from .640 to .863. This factor explains how customers perceive the fairness of the bank when it is managing customers' complaints, comments, and suggestions aimed at improving the quality of service. It also addresses how customers perceive the bank's processes for managing complaints in terms of quality and outcomes. These issues have been examined in the literature and found to have a significant impact on the loyalty and continuity of customers in terms of using banking e-services (Mathew et al., 2020; Yung & Seok, 2017).

The third factor, security and safety, is crucial and can have a serious impact on a customer's continued use of banking e-services (Asad et al., 2016; Pakojwar & Uke, 2014). This factor included 24 items, and the loading values of the items ranged from .514 to .882. This factor has also been reported in the literature (Eneji et al., 2017; Khadem & Mousavi, 2013).

The fourth factor is e-service recovery and banking choices. It included 19 items, and the loading values of the items ranged from .511 to .795. This factor emphasizes the importance of customer experience, the perceived outcome of the recovery effort made by the bank, and its effect on the choice to use banking e-services. This factor reflects whether customers would choose e-services as legitimate banking services in the future and determines how such services could become part of an individual's daily economic activities. This factor has been discussed widely in the literature for more than a decade and still poses a serious challenge to the global banking sector (Hammoud et al., 2018; Keramati et al., 2018). It includes the time and speed of the service and the outcome of risk management.

Regarding the effect of the participants' demographic characteristics and the question of whether the sample was an appropriate proportional representation of the country's banking e-service users, access to a national data set of banking e-service users was not possible. The researcher was unable to identify a private, governmental, or non-governmental agency that collects such data. In this study, most of the participants were male (n = 422, 76%). Given that it was not possible to access country-level data on banking e-service users, assumptions cannot be made about the representativeness of the sample in terms of gender and other characteristics, such as age and education level.

A limitation of this study is that only the CEBES was applied, and this instrument requires further testing on other populations to confirm its validity, stability, and reliability. In addition, the proportional representation of the study sample, at the national or international level, was not determined. Consequently, the generalizability of the study results, even to the Saudi population, is limited. The use of a convenience non-probability sampling method to recruit participants might have affected the results; for instance, the sample might have disproportionally included people interested in banking e-services or who had a positive experience with these services. Therefore, it is recommended that this study be replicated with a broader population that includes customers of different banks and with different experiences and perceptions.

Conclusions

The findings of this study show that the CEBES is statistically valid and reliable. The CEBES also has potential as an instrument for assessing the factors that influence customers' experiences with banking e-services. However, further testing is necessary to determine its validity, reliability, and stability over time and with other populations.

Therefore, further empirical investigation of the factors that influence customers' experience with e-service banking is warranted if banks are interested in expanding the scope of their services.

This study has practical implications for policymakers and bank stakeholders. For example, they should address all the influential factors identified in this study to improve e-service outcomes and increase customer satisfaction. There is also a need to develop policies that address the factors reported in this study so that competent individuals can be recruited to support improvement in the professional standards and practice of midwifery and promote better attitudes among service recipients.

In summary, limited studies have examined the experiences that customers have with banking e-services in the Saudi context and the influencing factors. The studies conducted to date have been descriptive and have not explored the dimensions of these experiences. We encourage researchers in Saudi Arabia, the Middle East, and other countries to use this research instrument and the findings that result from its use to improve customers' experiences with banking e-services.

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