


“Identifying key determinants of e-banking during COVID-19 in Bangladesh – Case Study on Chattogram city”

AUTHORS	Md. Shahnur Azad Chowdhury Engg Md. Shahidul Islam Manjurul Alam Mazumder Sayma Hoque Habib Ullah
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Md. Shahnur Azad Chowdhury, MSc, MBA, Associate Professor, Faculty of Business Studies, Department of Business Administration, International Islamic University Chittagong, Bangladesh.

Engg Md. Shahidul Islam, Divisional officer, Bangladesh Forest Research Institute, Bangladesh.

Manjurul Alam Mazumder, MBA, Assistant Professor, Faculty of Business Studies, Department of Business Administration, International Islamic University Chittagong, Bangladesh. (Corresponding author)

Sayma Hoque, MBA, Assistant Professor, Faculty of Science, Department of Computer Science and Engineering, International Islamic University Chittagong, Bangladesh.

Habib Ullah, MBA, Assistant Professor, Department of Business Administration, International Islamic University Chittagong, Bangladesh.



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Md. Shahnur Azad Chowdhury (Bangladesh), Engg Md. Shahidul Islam (Bangladesh), Manjurul Alam Mazumder (Bangladesh), Sayma Hoque (Bangladesh), Habib Ullah (Bangladesh)

IDENTIFYING KEY DETERMINANTS OF E-BANKING DURING COVID-19 IN BANGLADESH – CASE STUDY ON CHATTOGRAM CITY

Abstract

Over the past two years, e-banking services became very popular and safe transaction processes in the context of COVID-19 in Bangladesh. The purpose of this study is to analyze how the pandemic has affected Bangladesh's e-banking system. Using stratified random sampling in a randomized block design, a questionnaire was developed that registered participants' responses on a five-point Likert scale to examine the current state of e-banking during the COVID-19 pandemic (January-February 2022). Survey response data from 200 respondents in the commercial port city of Chattogram, Bangladesh, were delivered and returned via e-mail and hand-to-hand delivery, to enable the researcher to learn users' opinions and e-banking satisfaction levels. To test the hypotheses, the study applied the Kolmogorov-Smirnov test, the Shapiro-Wilk test, Spearman's rho correlation coefficient, the Mann-Whitney U test, and the Kruskal-Wallis H test. The study found that e-banking infrastructure facility, customer e-banking awareness, and the e-banking security service facility were important determinants in increasing bank e-service quality. The e-banking infrastructure and security services facility impressed younger users more than older customers (mean performance: 3.21 and 2.85 vs. 2.48 and 2.16, respectively). Educational qualifications did not affect perceptions of bank e-service quality, the e-banking infrastructure facility, customer e-banking professional knowledge, customer e-banking awareness, and the e-banking security service facility. Customers reported more fascination with private banks than with government-owned banks regarding bank e-service quality, e-banking infrastructure facilities, and customer e-banking awareness (mean performance: 3.51, 3.17, and 4.19 vs. 2.97, 2.29, and 3.65, respectively). Moreover, income level affected customers' e-banking professional knowledge.

Keywords

Covid-19, e-banking, professional knowledge, bank customer, Bangladesh

JEL Classification

G20, H12

INTRODUCTION

During the COVID-19 pandemic, the financial sector in Bangladesh faced significant difficulties. Nonetheless, there has been a surge in the use of electronic banking across the country, in both rural and urban areas, as a result of the industry's obligation to fulfill the requirements of those who make use of financial services. The efficiency of a country's banking system is directly proportional to that state's rate of economic growth (Ayadi et al., 2015). E-banking made it possible to provide various services such as mobile banking, Internet banking, and automated teller machine (ATM) services. Strategically speaking, in this age of digitization, online banking services have allowed individual banks to set themselves apart from more conventional competitors by better meeting their customers' requirements and expectations. The growing popularity of online banking services underscores the need for academics to focus on customers' experiences with these in-

stitutions. Among Bangladeshi financial institutions, the use of the Internet for banking purposes has been expanding at a rapid rate. All of Bangladesh's financial institutions have dedicated websites for convenient and secure Internet banking. Bangladeshi banks must prioritize customer satisfaction when it comes to online banking if they want to maintain a high percentage of happy online consumers.

E-banking refers to all types of banking activities performed through electronic networks and devices, such as personal computers (PCs), Personal Digital Assistants (PDAs), Automated Teller Machines (ATMs), debit cards, credit cards, online banking, phone banking, and SMS banking (Zayed et al., 2019). As part of e-business, e-banking dismissed the geographical obstacle and, at the same time, became popular for its convenience, its cheaper, multifunctional, and swift services, and its trendy, hassle-free operation (Bashiret et al., 2015). The requirements for e-banking have become significantly higher during the COVID-19 pandemic in the last two years as physical distancing, the best precautionary measure against this disease, is only possible through e-banking. To achieve competitive advantage in these circumstances, banks have had to enhance e-banking services. As a result, according to the Bangladesh Bank 2020–2021 annual report, the percentage of total branches online was 88.45 before the pandemic (during June 2019), and that increased to 95.48 percent at the end of 2021. Few studies in Bangladesh have investigated the e-banking aspects that contributed to customer satisfaction during the pandemic (Sarker et al., 2020; Jahan & Shahria, 2022).

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

E-banking, a technology based online, is new and fairly unknown to certain individuals in Bangladesh, owing to the digital divide, as well as the varying levels of Internet experience and settings. Since 2001, customers in Bangladesh have had access to online banking services. Hasan et al. (2010) observed the significant gap in customers' existing knowledge of Internet banking.

Islam and Imran (2020) found that perceived utility, social impact, and perceived enjoyment were all significant predictors of the propensity to use online banking services in Bangladesh. Their findings also revealed that service quality had the greatest significant impact on an individual's behavioral intention to use online banking in this nation, outweighing social influence by a factor of two to one. In contrast to international banks, several big private and national banks, as well as certain regional banks, have only lately offered Internet-based banking (Shahriar, 2014). Despite many banks having made significant investments in online banking, the adoption of Internet banking has not been as rapid as anticipated. Majumder (2014) discovered high levels of customer satisfaction with e-banking and banking issues.

In a study of respondent polling, Skvarciany and Jureviciene (2018) found that gender, an essential factor in trust-building, differs in each of the analyzed countries. The important item for trust-building in Lithuania is information and the bank; in Latvia, the website; in Estonia, the bank. In this study, the following constraints (the only limitations) apply:

- 1) the online survey of gender based customers (however, because Internet banking appeals to Internet users, this limitation is not critical);
- 2) the analysis of only the trust-building criteria that have a positive impact;
- 3) the assessment of only the sub factors by experts.

Females express great dissatisfaction with the inability to enjoy a physically satisfying buying experience while purchasing online. The majority of Bangladeshi clients, both male and female, are unaware of the importance of e-bank security. Female users are more conscientious than their male counterparts. Poorly educated women hesitate to use-banking transactions, according to the findings of the study (Sadekin et al., 2013).

Munir (2017) conducted a study that demonstrated bank management's responsibility for ensuring the security of e-banking transactions, not on-

ly for customers but also for their bank employees. Hasan (2010) revealed that e-banking provides several benefits to the Bangladeshi banking sector; nevertheless, the findings also revealed that Bangladeshi clients lack sufficient awareness about the services the banking industry provides in Bangladesh through electronic banking. A discussion of the ramifications of these findings, as well as their limitations, appears in the conclusion. According to Mohiuddin (2014), the further development of e-banking requires enhancing the security and privacy components of the system. According to the findings, Mohiuddin (2015) discovered that dealing officers of banks do not fully know their desk work. Ashraf (2010) found that ideas about trust and privacy favorably influence attitudes about Internet banking. In his study, Hoque (2016) discovered a widespread consensus among Singaporeans that among different age groups, the Internet is a handy medium for information search and purchase transactions. The respondents with higher levels of education in the middle age group appear more concerned about security risks. They also believe that online buying offers better pricing and more cost savings than traditional purchasing.

Khalil et al. (2017) conducted an investigation in which they examined the perspective of the client, the overall increase in education (particularly computer literacy), and the developing large network of ISPs that will provide an enabling environment for the customer to feel secure doing Internet banking transactions. Hosseini et al. (2013) evaluated that education has a beneficial impact on consumers' uptake of Internet banking services. Furthermore, the findings indicate a variety of elements that influence confidence in electronic services. Redwanuzzaman and Islam (2013) investigated the considerably growing number of educated people utilizing electronic banking, which has gained remarkable popularity among bank customers in recent years, and expert bankers hope that this popularity will continue to grow day by day as they nurture the product.

A bank is a financial organization in which individuals may deposit their money for increased levels of safety. Munir (2017) found that bank management should ensure the security of e-banking transactions for not only customers but also their

bank staff. Islam and Ahmed (2020) identified perceived usefulness, social influence, and perceived enjoyment to be significant predictors of individuals' intention to adopt Internet banking services in Bangladesh, with perceived usefulness having the highest significant impact. Barua and Akber (2021) found that technological disturbance, insufficient infrastructure, unavailability of service in rural areas, and high service charges are the major challenges of e-banking service in Bangladesh. A study of that service revealed that banking required the bare minimum of manpower (Adekin & Shaikh, 2013); compared to traditional banking, e-banks require the fewest personnel. Customers who withdraw and deposit money from ATM booths worry about a hijacker robbing them. It is not safe to use any of the ATMs that Bangladeshi banks operate.

Research that investigates the effects of such factors as age, gender, money, experience, and education level on the concepts of trust, risk, and security is lacking. However, the moderating impacts of demographic variables on the security impression of e-banking users are experiential rather than empirical (Rahman, 2007). More crucially, unique personality traits and regional features might affect how people perceive their level of safety, which ultimately leads to a poor adoption rate for electronic banking. Majumder et al. (2013) showed that customer satisfaction and difficulties regarding e-banking technologies relate to consumers' socioeconomic and demographic characteristics, i.e., gender, income, and age. In general, trust is a key aspect in many different social relationships, especially those involving ambiguity and reliance on others. Trust may function as a mechanism that decreases the complexity of human behavior in times of uncertainty. Shidrokh et al. (2013) revealed that consumer trust has a positive effect on the adoption of Internet banking.

COVID-19 saw a fall-off in traditional banking but an increase in e-banking. Therefore, the ability to empirically assess financial services is necessary for making sense of behavioral shifts. The development of electronic banking led to a streamlined series of more affordable services, on both a per-transaction and a per-year basis, and included improved safety features. Various studies have addressed e-banking development, prospects, cus-

tomers satisfaction, and challenges, but no study has been found on the e-banking scenario in the COVID-19 situation.

This study attempts to contribute to closing this gap by identifying the determinants of e-banking in Bangladesh.

The study proposes the following hypothesis:

- H_1 : *Bank e-service quality positively correlates with e-banking facilities, knowledge, awareness, and services.*
- H_2 : *Significant differences in key factors of e-banking correlate with gender.*
- H_3 : *Key factors of e-banking facility significantly correlate with age group.*
- H_4 : *Key factors of e-banking facility significantly correlate with education.*
- H_5 : *A significant difference in key factors of e-banking facility exists between government-owned and private banks.*
- H_6 : *Key factors of e-banking facility significantly differ by income level.*

2. METHODOLOGY

To study the present status of e-banking, a survey questionnaire was developed to gather data on bank e-service quality, e-banking infrastructure facility, customer e-banking professional knowledge, customer e-banking awareness, and e-banking security service facility. All these variables are measured using a five-point Likert scale ranging from 1 = Very Poor to 5 = Excellent. The survey questionnaire was pretested with 12 respondents; then, the questionnaire was finalized by making necessary corrections and modifications according to respondent suggestions. The survey responses came from 218 bank customers, identified by systematic random sampling in a randomized block design, from the commercial port city of Chattogram, Bangladesh, in January and February 2022. The selected survey response data were coded in Microsoft Excel 2016 and IBM SPSS

Statistics 20 software for further analysis. Among the collected response data, 200 responses were analyzed, those that remained after disqualifying respondents who answered all the questions the same or did not answer many questions.

Among the respondents, 110 (55%) were male and 90 (45%) were female. Age groups included 30 or fewer years at 16.5% (33) respondents, 31–40 years at 30% (60) respondents, 41–50 years at 31.5% (63) respondents, and 51 or more years at 22% (44) respondents. All respondents were experienced in e-banking with either state-owned or commercial banks (Sonali Bank Ltd., Janata Bank Ltd., Pubali Bank Ltd., and Rupali Bank Ltd.), with 77 respondents (38.5%) experienced in private commercial banks (BRAC Bank Ltd., Prime Bank Limited, Islami Bank Limited of Bangladesh, Mutual Trust Bank Ltd., Mercantile Bank Ltd., and Eastern Bank Limited). Regarding educational qualifications, of 123 (61.5%) respondents, 85 (42.5%) had graduated, 93 (46.5%) respondents held a Master's degree, and 22 (11%) had a Ph.D. The monthly income of 30,000 or less accounted for 55 (27.5%) respondents, 30,000–40,000 for 69 (34.5%), 40,000–50,000 for 57 (28.5%) respondents, and more than 50,000 for 19 (9.5%).

The descriptive analysis value of each response variable was calculated using the Kolmogorov-Smirnov and Shapiro-Wilk tests. To test the hypotheses, Spearman's rho correlation coefficient, the Mann-Whitney Test, and the Kruskal-Wallis test were conducted.

3. RESULTS

3.1. Descriptive analysis and normality test

The descriptive analysis of Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility appears in Table 1.

Minimum and maximum values of Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking

Table 1. Descriptive statistics and normality test

Sl. No	Questionnaire	N	Min	Max	Mean	Standard Deviation	Kolmogorov-Smirnov statistic (Sig.)	Shapiro-Wilk statistic (Sig.)
1.	Bank E-Service Quality	200	2	5	3.31	0.99	0.235 (0.000)	0.867 (0.000)
2.	E-Banking Infrastructure	200	1	5	2.83	1.25	0.182 (0.000)	0.909 (0.000)
3.	E-Banking Professional Knowledge	200	1	5	2.77	1.07	0.195 (0.000)	0.907 (0.000)
4.	E-Banking Awareness	200	2	5	3.98	1.03	0.230 (0.000)	0.822 (0.000)
5.	E-Banking Security	200	1	4	2.50	0.91	0.211 (0.000)	0.880 (0.000)

Security service facility are 2, 1, 1, 2, 1 and 5, 5, 5, 5, 4, respectively, with mean and standard deviation of 3.31 ± 0.99 , 2.83 ± 1.25 , 2.77 ± 1.07 , 3.98 ± 1.03 , and 2.50 ± 0.91 , respectively. The Kolmogorov-Smirnov test statistic and Shapiro-Wilk test statistic for Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility are 0.235 and 0.867, 0.182 and 0.909, 0.195 and 0.907, 0.230 and 0.822, 0.211 and 0.880, respectively. The significance values of the Kolmogorov-Smirnov and the Shapiro-Wilk test statistical values are 0.000 (< 0.01). So, the data values are not normally distributed, and nonparametric statistical tests were conducted to test hypotheses.

3.2. Test of hypothesis 1

Spearman's rho correlation coefficient of Bank E-Service Quality with E-Banking Infrastructure facility, E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility appear in Table 2.

From Table 2, the Spearman rho correlation coefficient of Bank E-Service Quality with E-Banking Infrastructure facility, Customer E-Banking Awareness, and E-Banking Security service facility are 0.427 ($p = 0.000$), 0.152 ($p = 0.032$), and 0.215 ($p = 0.002$), respectively. The null hypothesis 1 is rejected (as the significance values are less than 0.05) for the correlation of Bank E-Service Quality with E-Banking Infrastructure facility, Customer E-Banking Awareness, and E-Banking

Security service facility. So, there are strong positive correlations between Bank E-Service Quality and E-Banking Infrastructure facility, Customer E-Banking Awareness, and E-Banking Security service facility. But Spearman's rho correlation coefficient of Bank E-Service Quality with Customer E-Banking Professional Knowledge was 0.012 ($p = 0.870$). There is not enough evidence to reject null hypothesis 1 (as the significance values are greater than 0.05) for the correlation of Bank E-Service Quality with Customer E-Banking Professional Knowledge. No correlation exists between Bank E-Service Quality and Customer E-Banking Professional Knowledge.

3.3. Test of hypothesis 2

To test significant differences in Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility by gender, the Mann-Whitney test was conducted. Table 3 shows the result.

The mean values with standard deviation for males and females for Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility are 3.22 ± 0.942 and 3.41 ± 1.059 , 2.86 ± 1.200 and 2.79 ± 1.311 , 2.75 ± 1.127 and 2.79 ± 1.000 , 3.92 ± 1.015 and 4.06 ± 1.042 , 2.42 ± 0.892 and 2.61 ± 0.920 , respectively. The mean values for females for Bank E-Service Quality,

Table 2. Spearman's rho correlation coefficient test

Variable Name	Variable Name	Spearman's rho correlation coefficient (Sig.)
Bank E-Service Quality	E-Banking Infrastructure	0.427 ($p = 0.000$)
	E-Banking Professional Knowledge	0.012 ($p = 0.870$)
	E-Banking Awareness	0.152 ($p = 0.032$)
	E-Banking Security	0.215 ($p = 0.002$)

Table 3. Mann-Whitney test for gender

Measured variable	Measured value	Number of observation	Mean performance	Standard deviation	Mann-Whitney test statistic (z) value	Sig. (2 tail)
Bank E-service quality	Male	110	3.22	0.942	1.261	0.207
	Female	90	3.41	1.059		
E-Banking Infrastructure	Male	110	2.86	1.200	0.528	0.598
	Female	90	2.79	1.311		
E-Banking Professional Knowledge	Male	110	2.75	1.127	0.369	0.712
	Female	90	2.79	1.000		
E-Banking Awareness	Male	110	3.92	1.015	1.132	0.258
	Female	90	4.06	1.042		
E-Banking Security	Male	110	2.42	0.892	1.401	0.161
	Female	90	2.61	0.920		

Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility values are slightly higher than the mean values for males. But the mean value for males for E-Banking Infrastructure facility is slightly higher than the mean value for females. To determine the significant difference between males and females, the Mann-Whitney Test was conducted. The z-statistics values of Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility are 1.261 ($p = 0.207$), 0.528 ($p = 0.598$), 0.369 ($p = 0.712$), 1.132 ($p = 0.258$), and 1.401 ($p = 0.161$), respectively. There is not enough evidence to reject null hypothesis 2 (as the significance values are greater than 0.05). So, there are no significant differences in Bank E-service quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility by gender.

3.4. Test of hypothesis 3

To test the significant difference of Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility for age groups, the Kruskal-Wallis Test was conducted, and the result appears in Table 4.

The mean with standard deviation of Bank E-Service Quality for those age 30 or less, and age groups 31-40, 41-50, and 50 or more are 3.55 ± 1.121 , 3.45 ± 0.891 , 3.19 ± 0.981 , and 3.09 ± 1.030 , respectively. The Chi-Square value of the Kruskal-

Wallis Test for Bank E-Service Quality is 6.160 ($p = 0.104$). There is not enough evidence to reject null hypothesis 3 (as the significance value is greater than 0.05) for Bank E-Service Quality. So, there is no significant difference in Bank E-Service Quality by age group.

The mean with standard deviation of E-Banking Infrastructure facility for 30 or less, 31-40, 41-50, 50 or more age group are 3.21 ± 1.341 , 3.32 ± 1.157 , 2.41 ± 1.213 and 2.48 ± 1.045 . The Chi-Square value of Kruskal-Wallis Test for E-Banking Infrastructure facility is 23.070 ($p = 0.000$). Null hypothesis 3 is rejected (as the significance value is less than 0.05) for E-Banking Infrastructure facility. So, there is a significance difference of E-Banking Infrastructure facility for age group. The lower-age-group users use more E-Banking Infrastructure facility than that of the higher age group.

The mean with standard deviation of Customer E-Banking Professional Knowledge for age groups 30 or less, 31-40, 41-50, and 50 or more are 3.03 ± 1.075 , 2.88 ± 1.209 , 2.65 ± 0.845 , and 2.59 ± 1.127 , respectively. The Chi-Square value of the Kruskal-Wallis Test for Customer E-Banking Professional Knowledge was 3.987 ($p = 0.263$). There is not enough evidence to reject null hypothesis 3 (as the significance value is greater than 0.05) for Customer E-Banking Professional Knowledge. So, there is no significant difference in Customer E-Banking Professional Knowledge by age group.

The mean with standard deviation of Customer E-Banking Awareness for 30 or less, 31-40, 41-50, 50 or more age group are 4.06 ± 0.998 , 4.25 ± 0.856 , 3.83 ± 1.071 and 3.77 ± 1.138 . The Chi-Square val-

Table 4. Kruskal-Wallis test for age group

Measured variable	Measured value	Number of observation	Mean performance	Standard deviation	Kruskal-Wallis Test (Chi-Square) value	Sig. (2 tail)
Bank E-service Quality	30 or less	33	3.55	1.121	6.160	0.104
	31-40	60	3.45	0.891		
	41-50	63	3.19	0.981		
	50 or more	44	3.09	1.030		
E-Banking Infrastructure	30 or less	33	3.21	1.341	23.070	0.000
	31-40	60	3.32	1.157		
	41-50	63	2.41	1.213		
	50 or more	44	2.48	1.045		
E-Banking Professional Knowledge	30 or less	33	3.03	1.075	3.987	0.263
	31-40	60	2.88	1.209		
	41-50	63	2.65	0.845		
	50 or more	44	2.59	1.127		
E-Banking Awareness	30 or less	33	4.06	0.998	6.475	0.091
	31-40	60	4.25	0.856		
	41-50	63	3.83	1.071		
	50 or more	44	3.77	1.138		
E-Banking Security	30 or less	33	2.85	0.939	12.831	0.005
	31-40	60	2.63	0.863		
	41-50	63	2.44	0.876		
	50 or more	44	2.16	0.888		

ue of Kruskal-Wallis Test for Customer E-Banking Awareness is 6.475 ($p = 0.091$). There is not enough evidence to reject null hypothesis 3 (as the significance value is greater than 0.05) for Customer E-Banking Awareness. So, there is no significance difference of Customer E-Banking Awareness for age group.

The mean with standard deviation of E-Banking Security service facility for the age 30 or less group and those for 31-40, 41-50, and 50 or more were 2.85 ± 0.939 , 2.63 ± 0.863 , 2.44 ± 0.876 , and 2.16 ± 0.888 , respectively. The Chi-Square value of the Kruskal-Wallis Test for E-Banking Security service facility is 12.831 ($p = 0.005$). Null hypothesis 3 is rejected (as the significance value is less than 0.05) for E-Banking Security service facility. So, there is a significant difference in E-Banking Security service facility by age group. The lower-age-group users feel more E-Banking Security service facility than the higher-age group.

3.5. Test of hypothesis 4

To test the significant difference of Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness and E-Banking Security service facility with respect to education,

the Kruskal-Wallis Test was conducted, and Table 5 shows the result.

The mean values with standard deviation of Graduation, Master's, and Ph.D. education levels for Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility are 3.29 ± 1.021 , 3.30 ± 0.987 , and 3.30 ± 1.002 ; 2.78 ± 1.285 , 2.98 ± 1.189 and 2.41 ± 1.297 ; 2.74 ± 1.060 , 2.80 ± 1.109 and 2.77 ± 0.973 ; 3.89 ± 1.024 , 4.10 ± 0.990 and 3.82 ± 1.181 ; 2.55 ± 0.866 , 2.49 ± 0.974 and 2.36 ± 0.790 , respectively. The mean values of respondents holding a Master's degree for Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, and Customer E-Banking Awareness are slightly higher than the mean values of those holding Graduation and Ph.D. qualifications. But the mean value of E-Banking Security service facility for respondents having the Graduation qualification is slightly higher than the mean value of those with Master's and Ph.D. qualifications. To determine the significant difference of Graduation, Master's, and Ph.D. qualifications, this study conducted the Kruskal-Wallis Test, the Chi-Square values of the Kruskal-Wallis Test for Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge,

Table 5. Kruskal-Wallis test for education

Measured variable	Measured value	Number of observation	Mean performance	Standard deviation	Kruskal-Wallis Test (Chi-Square) value	Sig. (2 tail)
Bank E-service Quality	Graduation	85	3.29	1.021	0.151	0.927
	Masters	93	3.30	0.987		
	Ph.D.	22	3.30	1.002		
E-Banking Infrastructure	Graduation	85	2.78	1.285	4.145	0.126
	Masters	93	2.98	1.189		
	Ph.D.	22	2.41	1.297		
E-Banking Professional Knowledge	Graduation	85	2.74	1.060	0.061	0.970
	Masters	93	2.80	1.109		
	Ph.D.	22	2.77	0.973		
E-Banking Awareness	Graduation	85	3.89	1.024	2.273	0.321
	Masters	93	4.10	0.990		
	Ph.D.	22	3.82	1.181		
E-Banking Security	Graduation	85	2.55	0.866	0.700	0.705
	Masters	93	2.49	0.974		
	Ph.D.	22	2.36	0.790		

Customer E-Banking Awareness and E-Banking Security service facility – 0.151 ($p = 0.927$), 4.145 ($p = 0.126$), 0.061 ($p = 0.970$), 2.273 ($p = 0.321$), and 0.700 ($p = 0.705$), respectively. There is not enough evidence to reject null hypothesis 4 (as the significance values are greater than 0.05). So, there are no significant differences in Bank E-service quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility that correlate with Graduation, Master's, and Ph.D. educational qualifications.

3.6. Test of hypothesis 5

To test the significant difference of Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer

E-Banking Awareness, and E-Banking Security service facility for government-owned and private banks, the Mann-Whitney Test was conducted, and the result appears in Table 6.

The mean values and standard deviation of government-owned banks and private banks for Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility are 2.97 ± 0.973 and 3.51 ± 0.961 , 2.29 ± 1.062 and 3.17 ± 1.239 , 2.58 ± 1.005 and 2.89 ± 1.095 , 3.65 ± 1.121 and 4.19 ± 0.909 , 2.35 ± 0.885 and 2.60 ± 0.912 , respectively. The mean values of private banks for Bank E-Service Quality, E-Banking Infrastructure, Customer E-Banking Professional Knowledge, Customer

Table 6. Mann-Whitney test for government-owned and private banks

Measured variable	Measured value	Number of observation	Mean performance	Standard deviation	Mann-Whitne Test statistic (z) value	Sig. (2 tail)
Bank E-service quality	Government own bank	77	2.97	0.973	3.860	0.000
	Private bank	123	3.51	0.961		
E-Banking Infrastructure	Government own bank	77	2.29	1.062	4.872	0.000
	Private bank	123	3.17	1.239		
E-Banking Professional Knowledge	Government own bank	77	2.58	1.005	1.914	0.056
	Private bank	123	2.89	1.095		
E-Banking Awareness	Government own bank	77	3.65	1.121	3.366	0.001
	Private bank	123	4.19	0.909		
E-Banking Security	Government own bank	77	2.35	0.885	1.826	0.068
	Private bank	123	2.60	0.912		

E-Banking Awareness, and E-Banking Security service facility are slightly higher than the mean values of government-owned banks. To determine the significant difference of government-owned banks and private banks, the Mann-Whitney Test was conducted. The z-statistics values of Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility are 3.860 ($p = 0.000$), 4.872 ($p = 0.000$), 1.914 ($p = 0.056$), 3.366 ($p = 0.001$), and 1.826 ($p = 0.068$), respectively. There is not enough evidence to reject null hypothesis 5 (as the significance values are greater than 0.05) for Customer E-Banking Professional Knowledge and E-Banking Security service facility. So, there is no significant differences between Customer E-Banking Professional Knowledge and E-Banking Security service facility for government-owned and private banks. But null hypothesis 5 is accepted (as the significance values are greater than 0.05) for Bank E-service quality, E-Banking Infrastructure facility, and Customer E-Banking Awareness. So, significant differences exist for Bank E-service quality, E-Banking Infrastructure facility, and Customer E-Banking Awareness for government-owned and private banks.

3.7. Test of hypothesis 6

To test the significant difference of Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility by income level, the Kruskal-Wallis Test was conducted, and the result appears in Table 7.

The mean with standard deviation of Bank E-Service Quality for 30,000 or less, 30,000-40,000, 40,000-50,000, and over 50,000 income levels are 3.45 ± 0.997 , 3.25 ± 0.930 , 3.23 ± 1.018 , and 3.32 ± 1.204 , respectively. The Chi-Square value of the Kruskal-Wallis Test for Bank E-Service Quality is 1.849 ($p = 0.604$). There is not enough evidence to reject null hypothesis 6 (as the significance value is greater than 0.05) for Bank E-Service Quality. So, there is no significant difference in Bank E-Service Quality by income level.

The mean with standard deviation of E-Banking Infrastructure facility for 30000 or less, 30,000-40,000, 40,000-50,000. More than 50,000 income levels are 2.85 ± 1.253 , 2.87 ± 1.224 , 2.82 ± 1.241 and 2.63 ± 1.422 . The Chi-Square value of Kruskal-Wallis Test for E-Banking Infrastructure facility is 0.814 ($p = 0.846$). There is not enough

Table 7. Kruskal-Wallis test for income level

Measured variable	Measured value	Number of observation	Mean performance	Standard deviation	Kruskal-Wallis Test (Chi-Square) value	Sig. (2 tail)
Bank E-service quality	30,000 or less	55	3.45	0.997	1.849	0.604
	30,000-40,000	69	3.25	0.930		
	40,000-50,000	57	3.23	1.018		
	More than 50,000	19	3.32	1.204		
E-Banking Infrastructure	30,000 or less	55	2.85	1.253	0.814	0.846
	30,000-40,000	69	2.87	1.224		
	40,000-50,000	57	2.82	1.241		
	More than 50000	19	2.63	1.422		
E-Banking Professional Knowledge	30,000 or less	55	2.71	1.165	12.538	0.006
	30,000-40,000	69	3.03	1.150		
	40,000-50,000	57	2.40	0.821		
	More than 50,000	19	3.11	0.809		
E-Banking Awareness	30,000 or less	55	4.16	0.898	3.542	0.315
	30,000-40,000	69	3.84	1.093		
	40,000-50,000	57	3.89	1.080		
	More than 50,000	19	4.21	0.918		
E-Banking Security	30,000 or less	55	2.51	0.998	1.001	0.801
	30,000-40,000	69	2.51	0.834		
	40,000-50,000	57	2.44	0.907		
	More than 50,000	19	2.68	0.946		

evidence to reject the null hypothesis 6 (as the significance value is greater than 0.05) for E-Banking Infrastructure facility. So, there is no significant difference of E-Banking Infrastructure facility for age group.

The mean with standard deviation of Customer E-Banking Professional Knowledge for income-level groups of 30,000 or less, 30,000-40,000, 40,000-50,000, and over 50,000 are 2.71 ± 1.165 , 3.03 ± 1.150 , 2.40 ± 0.821 , and 3.11 ± 0.809 , respectively. The Chi-Square value of the Kruskal-Wallis Test for Customer E-Banking Professional Knowledge is 12.538 ($p = 0.006$). Null hypothesis 6 is rejected (as the significance values are less than 0.05) for Customer E-Banking Professional Knowledge. So, there is a significant difference in Customer E-Banking Professional Knowledge by income level.

The mean with standard deviation of Customer E-Banking Awareness for 30000 or less, 30,000-40,000, 40,000-50,000, and more than 50,000 income levels are 4.16 ± 0.898 , 3.84 ± 1.093 , 3.89 ± 1.080 and 4.21 ± 0.918 . The Chi-Square value of Kruskal-Wallis Test for Customer E-Banking Awareness is 3.542 ($p = 0.315$). There is not enough evidence to reject the null hypothesis 6 (as the significance values are greater than 0.05) for Customer E-Banking Awareness. So, there is no significant difference of Customer E-Banking Awareness for income level.

The mean with standard deviation of E-Banking Security service facility for income-level groups of 30,000 or less, 30,000-40,000, 40,000-50,000, and more than 50,000 are 2.51 ± 0.998 , 2.51 ± 0.834 , 2.44 ± 0.907 , and 2.68 ± 0.946 , respectively. The Chi-Square value of the Kruskal-Wallis Test for E-Banking Security service facility is 1.001 ($p = 0.801$). There is not enough evidence to reject null hypothesis 6 (as the significance values are greater than 0.05) for E-Banking Security service facility. So, there is no significant difference of E-Banking Security service facility by income level.

4. DISCUSSION

The result shows a strong positive correlation between Bank E-Service Quality with E-Banking Infrastructure facility, Customer E-Banking

Awareness, and E-Banking Security service facility. E-Banking service quality depends on the operational environment (E-operation and perceived enjoyment), E-Banking Security service, and the E-Banking communication environment (Banking's adoption, growth, and perceived enjoyment), contributing to the level of customer satisfaction with E-Banking (Chowdhury et al., 2022). But there is no correlation between Bank E-Service Quality and Customer E-Banking Professional Knowledge. So, with the increase of E-Banking Infrastructure facility, Customer E-Banking Awareness, and E-Banking Security service facility, Bank E-Service Quality will also increase. Banks and similar businesses must take the needs of their customers seriously, particularly during challenging times like the current pandemic; otherwise, the banks risk losing consumers. But the Customer E-Banking Professional Knowledge will not affect the Bank E-Service Quality.

As the result shows, there are no significant differences in Bank E-service quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility by gender (Grazhdani & Merollari, 2015). Conversely, female customers may place a higher value on service quality than male customers, according to research that Stafford (1996) cited. On the other hand, Snipes et al. (2006) discovered that male consumers were more likely than female customers to rank the fairness and quality of service higher for given services. According to the findings of Spathis et al. (2004), male customers of Greek banks are more likely to have a favorable opinion of the level of service they receive.

Also, the result shows no significant difference of Bank E-Service Quality, Customer E-Banking Professional Knowledge, and Customer E-Banking Awareness by age group. But there is a significant difference in E-Banking Infrastructure facility and E-Banking Security service facility by age. The lower-age users feel more E-Banking Infrastructure facility and E-Banking Security service facility than those of higher age. Gupta (2011) discovered that individuals' perceptions of the quality of service that banks provided varied depending on their gender, age, occupation, degree of education, and level of income. Gupta also

discovered that demographic variables, including income and age, varied across groups.

No significant differences appeared in Bank E-service quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness, and E-Banking Security service facility for Graduation, Master's, and Ph.D. educational qualifications. However, a person's level of literacy was a significant determinant in the ability to use online banking services their financial institutions offered. Due to the fact that all customers in this study were literate, online banking literacy was a significant factor in how they used online banking services. At the onset of widespread use of electronic banking, younger men with higher education and money reported a greater sense of safety (Lim et al., 2019).

No significant differences appeared in Customer E-Banking Professional Knowledge and E-Banking

Security service facility for government-owned and private banks, but significant differences between them did appear in Bank E-service quality, E-Banking Infrastructure facility, and Customer E-Banking Awareness. The private-bank users feel more Bank E-service quality, E-Banking Infrastructure facility, and Customer E-Banking Awareness than users of government-owned banks. However, customers are significantly less pleased with public commercial banks than they are with private commercial banks (Iqbal, 2013).

The result also shows no significant differences in Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Awareness, and E-Banking Security service facility by income level. However, Ramesh et al. (2019) found a correlation between respondents' perceptions of e-banking offerings and their income levels. A significant difference appears in Customer E-Banking Professional Knowledge by Income level.

CONCLUSION

Covid-19 brings new momentum at E-Banking services in Bangladesh. The people of the country received most of the facilities of the bank through E-banking services during the COVID-19 pandemic, when it was a great challenge to think to go outside the home. Most of customers became familiar with the e-banking services during this time. To take future policies for upgrading the e-banking services of a bank, empirical research is needed. The present study tried to fill up this gap. Thus, the study determined the Bank E-service quality in terms of different aspects of E-Banking services and knowledge in Chattogram, Bangladesh.

The result shows that the increase in E-Banking Infrastructure facility, Customer E-Banking Awareness and E-Banking Security service facility will increase Bank E-Service Quality. But a customer's E-Banking Professional Knowledge will not affect the Bank E-Service Quality. It is observed that gender has no effect on Bank E-service quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness and E-Banking Security service facility. E-Service Quality, Customer E-Banking Professional Knowledge and Customer E-Banking Awareness are not affected by age group. But E-Banking Infrastructure facility and E-Banking Security service facility are affected by age group. The lower-age-group users feel more E-Banking Infrastructure facility and E-Banking Security service facility than that of the higher age group. The result also shows that educational qualification has no effect on Bank E-service quality, E-Banking Infrastructure facility, Customer E-Banking Professional Knowledge, Customer E-Banking Awareness and E-Banking Security service facility. It is also observed that Customer E-Banking Professional Knowledge and E-Banking Security service facility are not affected by Government-owned bank and Private bank. But Bank E-service quality, E-Banking Infrastructure facility and Customer E-Banking Awareness are effected by Government own bank and Private bank. Private bank users feel more Bank E-service quality, E-Banking Infrastructure facility and Customer E-Banking Awareness than that of a Government-owned bank. The result also shows that Bank E-Service Quality, E-Banking Infrastructure facility, Customer E-Banking Awareness and E-Banking Security service facility are not affected by income level. But Customer E-Banking Professional Knowledge is affected by Income level.

So, the Customer E-Banking Professional Knowledge for Income level may be used to increase Bank E-service quality. The above suggestions will be used to develop a planning and utilization strategy to increase the E-Banking facility of Bangladesh in the future.

AUTHOR CONTRIBUTIONS

Conceptualization: Md. Shahnur Azad Chowdhury, Engg Md. Shahidul Islam, Manjurul Alam Mazumder, Sayma Hoque, Habib Ullah.

Data curation: Manjurul Alam Mazumder.

Formal analysis: Md. Shahnur Azad Chowdhury, Manjurul Alam Mazumder.

Funding acquisition: Md. Shahnur Azad Chowdhury, Engg Md. Shahidul Islam, Sayma Hoque.

Methodology: Engg Md. Shahidul Islam.

Project administration: Habib Ullah.

Resources: Md. Shahnur Azad Chowdhury, Sayma Hoque, Habib Ullah.

Software: Engg Md. Shahidul Islam, Manjurul Alam Mazumder.

Supervision: Md. Shahnur Azad Chowdhury.

Validation: Engg Md. Shahidul Islam, Sayma Hoque, Habib Ullah.

Visualization: Sayma Hoque, Habib Ullah.

Writing – original draft: Engg Md. Shahidul Islam, Md. Shahnur Azad Chowdhury, Manjurul Alam Mazumder.

Writing – reviewing & editing: Md. Shahnur Azad Chowdhury, Manjurul Alam Mazumder.

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