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RESEARCH ARTICLE

Performance Analysis of Mobile Banking During the COVID-19 Pandemic Period Comparing with the Pre-pandemic Period of Covid-19: An Empirical Study on Bangladesh

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Abstract: Mobile banking is a growing enforcement to engage the non-banking people to banking system in Bangladesh, so researchers of this paper try to find out how much it is affected by Corona virus (COVID-19). Basically this study is developed in order to assess the performance of mobile banking during the COVID-19 pandemic period comparing with the pre-pandemic period. Authors use descriptive statistics to evaluate the performance of mobile bank during the study period from 2014 to August 2020. This paper finds that during the COVID period the average change of monthly number of active accounts & registered clients have increased, on the other hand the average change of monthly number of agents have decreased at the same time. Except cash in & cash out the all others types of transactions proportion of mobile banking have increased during the COVID-19 period. As the mobile banking is a key resource for banking people as well as non-banking people to transact financial things at setting at the house, so this paper will be beneficial for mobile banking service provider organization to assess the whole things of mobile banking at this ongoing period and they can take necessary action.

Keywords: *Mobile Banking, COVID-19, Financial Performance, Hypothesis.*

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Introduction

Mobile! It is a common word for people and banking system is trying to get familiar with their existence in front of people by using this word. Right now the world is passing a pandemic period (Covid-19 period) that's why people cannot move anywhere for doing money related activities. So they are always searching a comfortable way so that they can meet their daily financial requirements. Mobile banking is the way by which people can use it setting at the room or at anywhere else whatever they are in now.

During the COVID-19 period its daily uses are increasing day by day because of isolation & home quarantine system and lockdown of the country. According to the FINCA news (2020) uses of mobile banking in USA has increased 85% during the COVID-19 period and so on for the others countries. During the pandemic period, clients of physical banking are shifting to the virtual banking mostly to the mobile banking. In USA many banks is launching virtual banking system for their customers [1]. In a recent research on China and Italy, shifting of customers to the digital platforms has increased 10% to 20% [2]. According to monetary authority of Hong Kong, using rate of mobile banking in Hong Kong rose during the COVID-19 period [3]. In the part of virtual banking, many banks is trying to link their services to the mobile banking system by which customers of these banks can transfer their funds to the mobile banking.

In this pandemic period, Social Islami Bank Limited (SIBL) in Bangladesh is requesting their customers to use bank apps not to frequently visit branch for any needs. They provide various types of facilities through this app so that customers of this bank can top up their funds to Bkash and they can provide payment to the various sectors like Desco, utility bill payments of Dpdc, Titas, Wasa and many others [4]. All the things are positive towards the mobile bank because of its banking system are easy and all the works

through online. In perspective of Bangladesh MFSs was started by Dutch-Bangla Bank Limited (DBBL) in 2012 but the full fledge operation took another two years. Currently 28 banks have the license for offering MFS and many institutions are waiting for authorization, even though 28 institutions have licenses, 15 are providing the services (Bangladesh Bank, 2020). These banks are providing the following services throughout the country.

Research Gap

This paper is very unique in nature in perspective of present situation in the world. There are many studies have been done in Bangladesh as well as in the world on Mobile Banking like financial inclusion through m-banking, consumer behaviors towards m-banking, performance measurement of m-banking at different perspectives, impact of m-banking on commercial bank's performance, preference perception of m-banking, prospects and challenges of m-banking, role of m-banking in case of enhancing financial performance, perceived risk of m-banking.

But so far no paper has been disclosed the performance of mobile banking during the COVID-19 pandemic period comparing with the pre-pandemic period. The researchers of this paper have tried to add some very effective information to the economy of Bangladesh and world about the current situation of mobile banking which are required for the current demand.

Objectives of the Study

This paper is prepared for fulfilling various types of objectives those is very effective for the mobile banking service provider organizations, mobile banking customers and general people in the country.

Among the all, the three broad objectives are demonstrated below:

- To represent the present scenario of mobile banking in Bangladesh.
- To measure the performance of mobile bank during the COVID-19 pandemic period and pre-pandemic period.
- To compare the performance of mobile bank between pre-pandemic period and pandemic period.

Literature Review

[5] Conducted a paper on "Mobile Banking and Performance of Commercial Banks in Kenya". They evaluate the relationship between mobile bank & commercial bank's performance and measure its effect on the adoption of mobile banking in Kenya. The authors consider customers perception about banks, attitudes on mobile banking and its effect on the performance of mobile bank and commercial bank through questionnaires to the customers & operation staffs. This paper is used Pearson's correlation model and regression analysis to examine the data.

The Authors disclosed that the performance of commercial bank and mobile banking are positively correlated to each other. They found that a customer perception towards the mobile bank has increased depends on positive performance of commercial bank [6]. Researched on "Mobile Banking and Organizational Performance in the Banking Industry". They try to explore how some factors of mobile banking affect the organizational and banking industry performance in Kenya.

They focus on the transactional security, delivery speed of services and cost of operation as indicator for measurement of the performance. Authors collect primary data through different types of questionnaires from the employees and customers of the bank and use descriptive statistical tools like Likert scale for measurement of the desired result. The author's finding shows that there is positive relationship between mobile banking and performance of banking organization.

The authors conclude that financial performance of banking sector is influenced by the mobile banking [7]. Studied on "Factors Influencing Adoption and Usage of Mobile Banking: Bangladesh Experience". They explore the factors which affect the adoption and usages of mobile banking in Bangladesh. They consider trustworthiness, complexity, security, network availability and cost and convenience influencing factor for measurement the perception towards mobile banking which may think of a customer when he/she is going to adopt mobile banking services. They take 400 mobile banking users as sample of the study over the 4 years.

This paper is analyzed by descriptive statistics like mean, median, mode, standard deviation, and linear regression model and hypothesis formulation. Authors find that demographic characteristics, trustworthiness & network problem do not influence the adoption of mobile banking on the other hand security, complexity & cost and convenience of using mobile banking affect the adoption of mobile banking service [8].Investigated on "Bangladeshi mobile banking service quality and customer satisfaction and loyalty". They attempt to investigate the various services quality of mobile bank and its impact on the customer satisfaction.

Authors select efficiency & convenience, assurance & security, reliability & responsiveness and locational advantage as the perception measurement tools of m-banking customers. This paper analysis collected information through regression analysis and finds that only the service quality is the prerequisite of m-banking organization for customer attraction and after that reliability & responsiveness and efficiency & convenience impact positive influence on customer satisfaction.

The author also finds that efficiency & reliability helps to retain the mobile banking customers in long run [9].Conducted a paper on "Impact of COVID-19 Outbreak in Digital Payments". They disclose how COVID-19 pandemic situation affects the various types of digital payment system in India. They demonstrate buying and payment behavior of customers during the lockdown period and pre-lockdown period.

The authors of this study collect information from primary and secondary sources and use T-test, Chi-square test and ANOVA test for analysis data in order to get the researched outcome. They find that there is significant difference between mode of payment during the lockdown period and pre-lockdown period but there is no significant difference between these times in case of groceries products, vegetables, hotels, transport mode of payment system.

Data and Methodology

This study is analyzed based on the secondary data which has been taken from mainly in Bangladesh bank website, various types of journals, magazines, reports and websites. For completion of the report descriptive statistical tools are used in order to measure the performance of mobile bank for the last 7 years (2014 to August 2020) at the pre-pandemic period of COVID-19 and COVID-19 period as well.

Among the descriptive tools, hypothetical analysis, percentile changes, graphical representation are used here. Descriptive statistics of number of agents, number of clients and number of active customers demonstrate how much change these respective data over the study period. ANOVA test clarifies is any significant difference among pre-pandemic period of

COVID-19, pandemic period and previous respective month to pandemic period of agents, clients and number of active customers. T-test identifies during the COVID-19 period the above data is changed or not. Percentage calculation and graphical representation is used for interpreting others types of mobile banking data which are changed during the COVID-19 period comparing with the pre-pandemic period of COVID-19.

Table 1: Time period for hypothesis analysis

ANOVA (F-Test) H1, H2, H3	Pre-pandemic period of Covid-19	Month	Jan, Feb, Mar, Sep, Oct, Nov, Dec
		Year	2014, 2015, 2016, 2017, 2018, 2019, 2020
	Pandemic Period	Month	Apr, May, June, Jul, Aug
		Year	2020
	Previous respective month to pandemic period	Month	Apr, May, June, Jul, Aug
		Year	2014, 2015, 2016, 2017, 2018, 2019
(T-Test) H4, H5, H6	Pre-pandemic period of Covid-19	Month	Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec
		Year	2014, 2015, 2016, 2017, 2018, 2019, 2020
	Pandemic Period	Month	Apr, May, June, Jul, Aug
		Year	2020

Author's Own Concern

The Following formulas are used for the T-test.

Sample standard deviation, S= 1

Standard error, $\overline{x_1} - \overline{x_2}$= $(\mu_1\text{-}\mu_2)H_0 \pm \text{TSP}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$

Here, SP= $\sqrt{\frac{(n_1-1)S_1^2+(n_2-1)S_2^2}{n_1+n_2-2}}$

Value of T = $\frac{(\overline{x_1}-\overline{x_2})-(\mu_1-\mu_2)H_0}{\text{SP}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$

Here, x= Principle Value

n_1= Number of Sample-1

n_2= Number of Sample-2

s_1= Sample-1 Standard Deviation

s_2

The Following formulas are used for the F (ANOVA)-test

Between column variance $\hat{\sigma}b^2 = \frac{\sum nj(\overline{x}j-\overline{\overline{x}})^2}{k-1}$

Within column variance $\hat{\sigma}w^2 = \sum(\frac{nj-1}{nT-k})s^2j$

For hypothesis analysis, the following hypotheses have been built for accomplishment of the objectives of this research paper.

Hypothesis of the Study

H1: There is significant difference between changes in the numbers of active customers among pre-pandemic period, pandemic period and previous respective month to pandemic period of COVID-19.

H2: There is significant difference between changes in the numbers of clients among pre-pandemic period, pandemic period and previous respective month to pandemic period of COVID-19.

H3: There is significant difference between changes in the numbers of agents among pre-pandemic period, pandemic period and previous respective month to pandemic period of COVID-19.

H4: The changes in the number of active customers are increased during the COVID-19 pandemic period.

H5: The changes in the numbers of clients are increased during the COVID-19 pandemic period.

H6: The changes in the numbers of agents are increased during the COVID-19 pandemic period.

Result Analysis

Descriptive Statistics

Table 2: Change in Average monthly number of active accounts per year (Amount Figure in Lac)

Description		Statistic							
		2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020 till March**	**2020 Apr to Aug**
Mean		4.650	0.887	2.213	4.272	13.603	-2.231	-26.003	27.456
95% Confidence Interval for Mean	Lower Bound	-0.472	-6.169	-1.362	-18.877	1.695	-21.821	-104.809	-16.068
	Upper Bound	9.772	7.943	5.788	27.420	25.510	17.360	52.803	70.980
5% Trimmed Mean		5.337	1.094	2.201	3.332	13.267	-2.869	.	27.582
Median		6.940	1.760	2.270	6.470	11.715	-2.550	-13.520	31.100
Variance		58.134	123.331	31.661	1327.398	351.210	950.679	1006.406	1228.710
Std. Deviation		7.625	11.105	5.627	36.433	18.741	30.833	31.724	35.053
Minimum		-14.580	-23.600	-8.850	-48.570	-9.720	-53.780	-62.070	-21.050
Maximum		11.510	21.640	13.500	74.020	42.960	60.810	-2.420	73.700
Range		26.090	45.240	22.350	122.590	52.680	114.590	59.650	94.750
Interquartile Range		8.420	9.243	4.673	41.558	37.923	39.715	.	61.680

Note: April to August in 2020 is the COVID-19 pandemic period.

Table 3: Change in Average monthly number of active accounts during three specified periods (Amount Figure in Lac)

Data		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	Between-Component Variance
						Lower Bound	Upper Bound			
Pre-pandemic period		44	0.693	23.988	3.616	-6.600	7.986	-62.070	74.020	44.000
Pandemic period		5	27.456	35.053	15.676	-16.068	70.980	-21.050	73.700	5.000
Previous respective month to pandemic period		30	5.586	20.640	3.768	-2.121	13.293	-40.960	59.540	30.000
Total		79	4.245	24.103	2.712	-1.154	9.644	-62.070	74.020	79.000
Model	Fixed Effects		23.512	2.645	-1.024	9.513				
	Random Effects			5.526	-19.533	28.023			51.358	51.3577

Above the Table 2 shows the change in average monthly number of active accounts per year and Table 3 shows the same point of data but three differences specified period over the study year between 2014 to August 2020. Table 2 demonstrates that mean value of change in number of active accounts was higher at the COVID-19 pandemic period that is 27.456 Lac, on the other hand mean value of change in active accounts was lower in 2020 till March that is negative value -26.003 lac. But over the study period 2014 to 2018 this value had ups and down trend. In case of risk factor, standard deviation

expresses that in the pandemic period the risk factor was higher than any others period.

Table 3 also displays that the number of active accounts as well as standard deviation were higher during the pandemic period comparing with the two others specified study periods. The maximum and minimum value of active accounts comparatively favorable than two others study period. Both two tables show that at the 95% confidence level of interval the pandemic period value helps to explore the meaning that during the COVID-19 pandemic period the number of active accounts increased.

Table 4: Change in Average monthly number of registered clients per year (Amount Figure in Lac)

Description		Statistic							
		2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020 till March**	**2020 Apr to Aug**
Mean		10.189	5.549	7.694	14.768	7.266	9.991	10.227	20.722
95% Confidence Interval for Mean	Lower Bound	6.648	1.205	5.105	1.274	2.958	4.513	1.490	2.949
	Upper Bound	13.731	9.893	10.283	28.263	11.573	15.469	18.963	38.495
5% Trimmed Mean		10.105	5.638	7.819	11.993	6.819	9.900	.	20.724
Median		9.880	6.375	7.390	8.330	5.235	8.280	9.410	24.010
Variance		27.790	46.748	16.601	451.100	45.959	74.326	12.368	204.875
Std. Deviation		5.272	6.837	4.074	21.239	6.779	8.621	3.517	14.313
Minimum		3.180	-6.160	-1.430	0.290	0.720	-2.310	7.190	3.640
Maximum		18.720	15.660	14.580	79.210	21.860	23.930	14.080	37.760
Range		15.540	21.820	16.010	78.920	21.140	26.240	6.890	34.120
Interquartile Range		9.700	9.515	2.865	6.168	3.908	16.355	.	27.580

Note: April to August in 2020 is the COVID-19 pandemic period.

Table 5: Change in Average monthly number of registered clients during the three specified periods (Amount Figure in Lac)

Data		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	Between-Component Variance
						Lower Bound	Upper Bound			
Pre-pandemic period		44	9.510	12.306	1.855	5.769	13.251	-6.160	79.210	
Pandemic period		5	20.722	14.313	6.401	2.949	38.495	3.640	37.760	
Previous respective month to pandemic period		30	8.918	6.929	1.265	6.331	11.505	-4.750	25.620	
Total		79	9.995	10.945	1.231	7.543	12.446	-6.160	79.210	
Model	Fixed Effects		10.713	1.205	7.594	12.395				
	Random Effects			2.375	-0.225	20.214			9.137	9.13721

Table 4 shows the change in average monthly number of registered clients per year and table 5 shows the same kinds of data but different three specified period. Both the tables explore that mean value of average change in monthly registered clients was higher during the COVID-19 pandemic period that is 20.7222 lac per month. At 95% confidence interval level the value of higher bound was and 38.495 lac that was also higher than any others study period. The 5% trimmed mean value displays the same

information. The maximum value, range, interquartile range of registered clients was higher during the pandemic period that is 37.760 lac, 34.120 lac and 27.580 lac respectively. Table 5 didn't show any different information. It also supports that during the COVID-19 pandemic period the average numbers of registered clients per month have increased.

Table 6: Change in Average monthly number of agents per year (Amount Figure in Lac)

Description		Statistic							
		2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020 till March**	**2020 Apr to Aug**
Mean		0.302	0.017	0.124	0.064	0.083	0.071	0.070	0.034
95% Confidence Interval for Mean	Lower Bound	0.157	-0.028	0.064	-0.016	0.065	0.046	0.001	-0.017
	Upper Bound	0.447	0.062	0.185	0.143	0.102	0.096	0.139	0.084
5% Trimmed Mean		0.315	0.019	0.125	0.074	0.086	0.072	.	0.035
Median		0.356	0.051	0.104	0.105	0.093	0.085	0.067	0.045
Variance		0.047	0.005	0.009	0.016	0.001	0.002	0.001	0.002
Std. Deviation		0.216	0.070	0.095	0.125	0.029	0.040	0.028	0.041
Minimum		-0.174	-0.099	-0.073	-0.264	0.010	0.007	0.044	-0.031
Maximum		0.539	0.085	0.302	0.203	0.117	0.125	0.099	0.068
Range		0.713	0.185	0.376	0.467	0.107	0.119	0.055	0.099
Interquartile Range		0.269	0.137	0.111	0.116	0.037	0.074	.	0.071

Note: April to August in 2020 is the COVID-19 pandemic period.

Table 7: Change in Average monthly number of agents during the three specified periods (Amount Figure in Lac)

Data		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	Between-Component Variance
						Lower Bound	Upper Bound			
Pre-pandemic period		44	0.092	0.129	0.019	0.053	0.131	-0.260	0.490	
Pandemic period		5	0.034	0.041	0.018	-0.017	0.084	-0.030	0.070	
Previous respective month to pandemic period		30	0.127	0.150	0.027	0.071	0.183	-0.080	0.540	
Total		79	0.101	0.135	0.015	0.071	0.132	-0.260	0.540	
Model	Fixed Effects		0.135	0.015	0.071	0.132				
	Random Effects			0.018	0.023	0.180			0.000	.00023

Table 6 shows the change in average monthly number of agents per year and table 7 shows the same kinds of data but three different study periods. The mean value of table 6 shows that the change of average monthly number of agents was higher in 2014 that is .302 lac and lower in 2015 that are .017 lac. During the COVID-19 pandemic period the monthly average numbers of agents have decreased. In table 7 shows that during the Previous respective month to pandemic period mean value was higher than two others different periods. As the mean value is higher at 2014 and Previous respective month to pandemic period so the risk factor is also higher during these periods. The

maximum value, minimum value, range, interquartile range also support to deliver the same results. So the researchers find that during this COVID-19 pandemic period the change in average monthly number of agents have decreased.

Table 8: Portion of individual transaction on total transaction in over the study period

Particulars	2014	2015	2016	2017	2018	2019	2020 Till March	Covid-19 Period (April to August)
Inward Remittance	0.04%	0.02%	0.03%	0.03%	0.10%	0.07%	0.07%	0.31%
Cash In transaction	42.61%	42.19%	42.62%	41.92%	40.96%	37.13%	35.18%	27.68%
Cash Out Transaction	37.49%	36.55%	38.44%	37.99%	37.81%	35.47%	32.97%	29.95%
P2P transaction	17.45%	17.67%	14.97%	14.90%	15.60%	20.49%	24.13%	29.64%
Salary Disbursement (B2P)	0.57%	0.82%	1.05%	1.45%	1.77%	2.35%	2.77%	5.01%
Utility Bill Payment (P2B)	1.11%	0.92%	0.97%	0.80%	0.88%	1.16%	1.09%	1.62%
Merchant Payment	0.00%		0.00%	0.46%	0.79%	1.26%	1.37%	1.64%
Government Payment				0.70%	0.61%	0.45%	0.45%	1.02%
Others	0.75%	1.81%	1.92%	1.73%	1.47%	1.63%	1.96%	3.14%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: Bangladesh Bank

Table 8 shows that the proportion of individual transaction over the study period. The authors mainly focus on the COVID-19 pandemic period. During the COVID-19 pandemic period cash in and cash out have declined to 27.68% and 29.95% comparing with the pre-pandemic period. The data shows that study period 2014 to till March of 2020 proportion of cash in and cash out are more than the current period of COVID-19. This situation happened because of lockdown of the country. The general public cannot move outside from their house for their requirement and all the outlets have closed down this moment. But in case of inward remittance (0.31%), p2p transaction (29.64%), salary disbursement (5.01%), utility bill payment (1.62%), merchant payment (1.64%), government payment (1.02%) and others types of mobile banking transactions (3.14%) proportion comparing with the pre-covid-19 period have increased. At the time of lockdown of the country government or private sector employees, foreigner, bank's customer and general public felt unsecured for going bank for making transaction that's why most of them are used mobile banking at staying their home and obviously mobile banking is comfortable tool for executing receipt and payment of money setting at the home.

Table 9: % of Individual transaction on total transaction during the pandemic period and pre-pandemic period

Particulars	Pandemic Period	Pre-pandemic Period	Deviation
Inward Remittance	0.31%	0.05%	0.26%
Cash In transaction	27.89%	40.37%	-12.48%
Cash Out Transaction	29.83%	36.67%	-6.84%
P2P transaction	29.96%	17.89%	12.07%
Salary Disbursement (B2P)	4.70%	1.54%	3.16%

Utility Bill Payment (P2B)	1.60%	0.99%	0.61%
Merchant Payment	1.59%	0.65%	0.94%
Government Payment	0.89%	0.37%	0.52%
Others	3.22%	1.61%	1.61%

Source: Bangladesh Bank

Table 9 shows the proportion of individual transaction on total transaction during the pandemic period and pre-pandemic period and differences between them. The authors find that during the COVID-19 pandemic period the cash in transaction and cash out transaction are declined from 40.37% to 27.89% and 36.67% to 29.83% respectively. On the other hand inward remittance is increased .05% to 0.31%, P2P transaction is increased 17.89% to 29.96%, salary disbursement (B2P) is increased 1.54% to 4.70%, utility bill payment (P2B) is increased 0.99% to 1.60%, merchant payment is increased 0.65% to 1.59%, government payment is increased 0.37% to .89% and others transaction is increased 1.61% to 3.22% respectively.

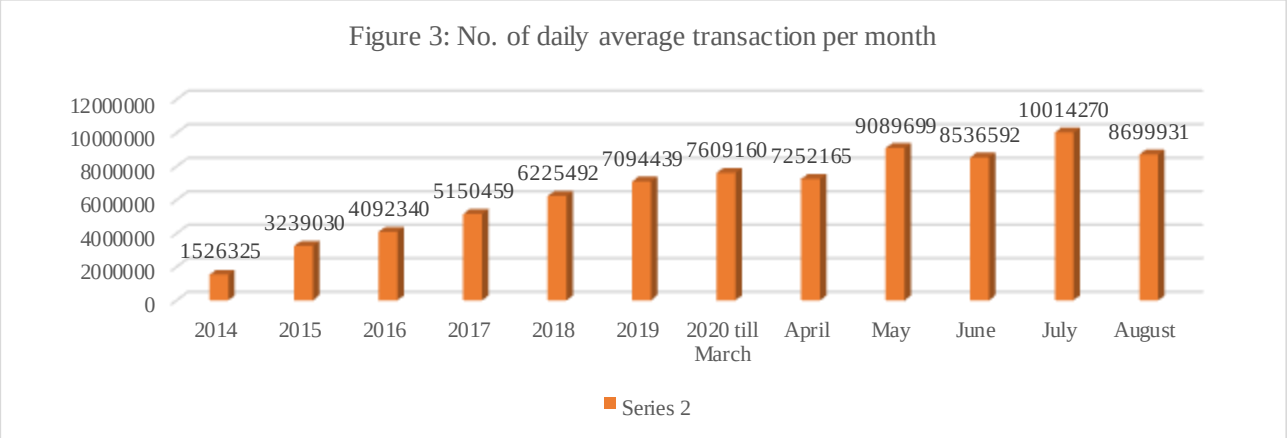

Figure 3: shows that no. of daily average transaction per month over the study period. At the earlier stage of mobile banking in 2014 the number of daily average transaction per month was 15, 26,325 and year by year this figure has sequentially increased. In the year of 2019 this figure was 70,94,439 and in 2020 till March it was 76,09,160 but during the COVID-19 pandemic period this figure was ups and down trend. This graph shows that in April 2020 the number of daily average transaction per month was 72,52,165 and accordingly it increased to 90,89,699 in May 2020 but in June, July, August it was ups & down figure that was 85,36,592, 1,00,14,270 and 86,999,31

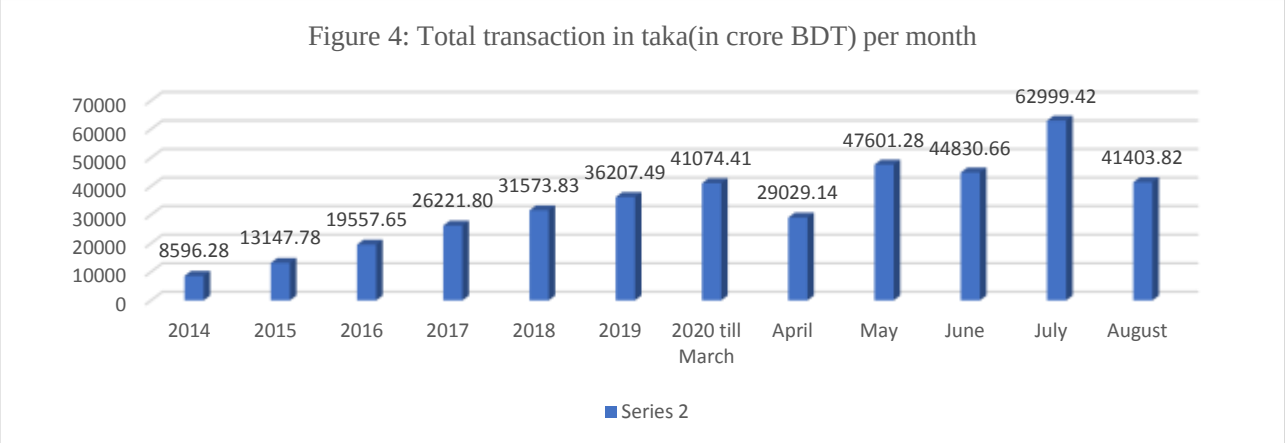

Figure 4 shows the average total transaction per month during the study period both pandemic period of COVID-19 and pre-pandemic period. From the year 2014 to till March of 2020 this figure has increased figure, in 2014 the amount of average monthly transaction was 8596.28 cores and sequentially in 2019 was 36,207.49 cores and in 2020 till March was 41,074.41 cores. The earlier stage of COVID-19 pandemic period the amount of average monthly transaction was very low that was 29,029.14 cores because of Corona virus fairness among the people and lockdown of the whole country but after beginning of the lockdown day by day the situation was recovering and it impacted on mobile banking transaction. This above figure shows that in July during the COVID-19 period the average monthly transaction was higher than any others month of the whole study period that was 62,999.42 cores but in August 2020 it declined in 41,403.82 cores. The amount of average transaction per month during the pandemic period was ups and down

H1: *There is significant difference between changes in the numbers of active accounts among pre-pandemic period, pandemic period and previous respective month to pandemic period of COVID-19.*

Table 10: ANOVA test (changes in the number of active accounts)

Data	Sum of Squares	Degree of Freedom	Mean Square	F	Sig.	Table Value at 5% sig. Level
Between Groups	3302.921	2	1651.461	2.987	.000	3.11698
Within Groups	42012.456	76	552.795			
Total	45315.377	78				

Above the ANOVA table shows the variance analysis (F-test) of changes in the number of active accounts of mobile banking over the study period at pre-pandemic period of COVID-19, pandemic period and previous respective month to pandemic period from the year 2014 to August 2020. It demonstrates that the actual value of F is 2.987 which are lower than the table value of F (3.11698) at 5% level of significant, so null hypothesis is sufficient to be accepted. The authors finds that from this hypothesis, there is no significant difference among the pre-pandemic period of COVID-19, pandemic period and previous respective month to pandemic period of number of mobile banking active accounts over the study period.

H2: *There is significant difference between changes in the numbers of registered clients among pre-pandemic period, pandemic period and previous respective month to pandemic period of COVID-19.*

Table 11: ANOVA Test (Changes in the Number of registered clients)

Data	Sum of Squares	Degree of Freedom	Mean Square	F	Sig.	Table Value at 5% sig. Level
Between Groups	620.490	2	310.245	2.703	.000	3.11698
Within Groups	8723.145	76	114.778			
Total	9343.636	78				

From the above ANOVA test the authors try to display the variance analysis (F-test) of changes in the number of registered clients of mobile banking over the study period at pre-pandemic period of COVID-19, pandemic period and previous respective month to pandemic period from the year 2014 to August 2020. This table shows that the calculated value of F (2.703) is lower than table value of F (3.11698) at 5% significant level, which means it lies on the confidence level so null hypothesis is accepted. The researchers find here there is no significant difference among the pre-pandemic period of COVID-19, pandemic period and previous respective month to pandemic period of number of mobile banking registered clients over the study period.

H3: *There is significant difference between changes in the numbers of agents among pre-pandemic period, pandemic period and previous respective month to pandemic period of COVID-19.*

Table 12: ANOVA Test (Changes in the Number of Agents)

Data	Sum of Squares	Degree of Freedom	Mean Square	F	Sig.	Table Value at 5% sig. Level
Between Groups	.046	2	.023	1.267	.000	3.11698
Within Groups	1.375	76	.018			
Total	1.421	78				

Above the table shows the ANOVA analysis of changes in the number of agents of mobile banking over the study period at pre-pandemic period of COVID-19, pandemic period and previous respective month to pandemic period from the year 2014 to

August 2020. It demonstrates the table value of F (3.11698) is higher than calculated value of F (1.267) at 5% level of significant, so null hypothesis cannot be rejected. Therefore, the authors finds that there is no significant difference among the pre-pandemic period of COVID-19, pandemic period and previous respective month to pandemic period of number of mobile banking agents over the study period.

Above the hypothesis analysis of H1, H2 and H3 express there is no significant difference among the pre-pandemic period of COVID-19, pandemic period and previous respective month to pandemic period of number of mobile banking changes of active accounts, changes of registered clients and changes of agents over the study period. Therefore, the researcher try to analysis is any differences between the pre-pandemic period of COVID-19 and pandemic period of COVID-19 or not. So two sample T-test is analyzed below in order to check the changes of active accounts, changes of registered clients and changes of agents of mobile banking have increased during the COVID-19 period or not.

H4: *The changes in the number of active customers are increased during the COVID-19 pandemic period.*

Table 13: T-test (Number of Active Accounts)

		t-test for Equality of Means							
		t	df	Sig. (2-tailed)	Table value at 5% sig. level	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Lower
Data	Equal variances assumed	-2.284	77	.000	+/-1.9913	-24.7795	10.848	-46.381	-3.178
	Equal variances not assumed	-1.559	4.229	.000		-24.7795	15.896	-67.987	18.428

Above the T-statistic table shows that the actual value of T (-2.284) is more than the critical (Table) value (+/-1.9913) that's why it is not sufficient to accept the null hypothesis. So this hypothesis expresses that the number of active accounts of mobile banking have increased during the COVID-19 pandemic period comparing with the pre-pandemic period of COVID-19. It means during the pandemic period the number of active accounts have more than before from January 2014.

H6: *The changes in the numbers of agents are increased during the COVID-19 pandemic period.*

Table 14: T-test (Number of Agents)

		t-test for Equality of Means							
		t	df	Sig. (2-tailed)	Table value at 5% sig. level	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Lower
Data	Equal variances assumed	1.164	77	.000	+/- 1.9913	.07242	.06222	-.05148	.19633
	Equal variances not assumed	2.993	12.312	.000		.07242	.02420	.01985	.12500

From the above T-statistic table the researchers find that actual value of T is 1.164 that is less than the table value of T (+/- 1.9913) at the 5% level of significance. So the research value is stayed on the confidence level that's why null hypothesis is accepted. It belongs to the meaning that the numbers of agents of mobile banking haven't increased during the pandemic period of COVID-19 comparing with the pre-pandemic period. So, during the COVID-19 period the number of agents is decreased.

H5: *The changes in the numbers of clients are increased during the COVID-19 pandemic period.*

Table 15: T-test (Number of Registered Clients)

		t-test for Equality of Means							
		t	df	Sig. (2-tailed)	Table value at 5% sig. level	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Lower
Data	Equal variances assumed	-2.328	77	.000	+/-1.9913	-11.4520	4.9199359	-21.2488	-1.65516
	Equal variances not assumed	-1.758	4.291	.000		-11.4520	6.5145481	-29.0661	6.16211

The above table shows the T statistic table of number of registered clients of mobile bank from the study period 2014 to august 2020. The author finds that from this table actual T value (-2.328) is more than acceptance region (Table value +/- 1.9913).As the actual value is situated in the significant level, so null hypothesis is rejected. It provides the result that the numbers of registered clients of mobile banking have increased during the pandemic period of COVID-19 comparing with the pre-pandemic period of COVID-19.

Findings

The authors find various undisclosed things regarding the mobile banking performance during the COVID-19 pandemic period comparing with the pre-pandemic period. In case of change in average monthly number of active accounts and change in average monthly numbers of registered clients are increased during the COVID-19 period but the change in average monthly number of agents is declined this period. The proportion of mobile banking individual transaction explore that except cash in & cash out, the all others individual transaction like inward remittance, P2P transaction, salary disbursement (B2P, utility bill payment, merchant payment, government payment and others types of transaction rate are increased during the COVID-19 pandemic period. This paper also finds that number of daily average transaction per month are comparatively higher during the COVID-19 period than pre-pandemic period, the total transaction in Taka per month gets ups & down trend during this COVID-19 period but some months in COVID-19 period total transactions amount are higher than pre-pandemic period average monthly total transaction. The authors revel by using hypothesis analysis that in case of F-test explores there is no significant differences in the changes of number of active accounts, changes of number of registered clients and changes of number of agents among the pre-pandemic period of COVID-19, pandemic period and previous respective month to pandemic period of the study year. The T-test discloses that during the COVID-19 pandemic period the number of active accounts, number of registered clients rate are increased and on the other hand the number of agents rate didn't increased this COVID-19 period.

Conclusion

The purpose for which this research paper is made which is fully demonstrated by the above result. The result implies that during the COVID-19 pandemic period mobile banking has extended its hand to help the people to collect, transfer, payment of fund at setting at the house whatever they are in rural area or urban area. At the Lockdown situation of whole country people can't go outside for their daily financial transaction but they are doing all these things by mobile banking at setting at the house. The average change in number of active accounts & registered clients are disclosing that during this COVID-19 period people feel pleasure & interested to create mobile banking account for getting banking services. In case of inward remittance, P2P transaction, salary disbursement (B2P, utility bill payment, merchant payment, government payment and others types of transaction rate of mobile banking, the customers of mobile banking get all the services from their house except cash in & cash out, because lockdown country area and general fear about CORONA virus affect it negatively which has found in this paper. All the result of this paper will knock the authority of mobile banking to furnish their

cash in & cash out facilities in such way so that the customer of mobile banking can get facilities of cash in & cash out at setting at the house, the author of this paper is thinking that will it be possible to provide door to door mobile banking services like Food Panda or others types of home delivery services provider system [10-25].

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