

Exploring the Behavior of App Developers and the Future of Digital Bangladesh

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Abstract

In 2009, the government of Bangladesh formulated a vision named as the “Vision 2021”. The main goal of the vision was to digitalize the services for bringing up them in front of people and make Bangladesh a middle-income country within 2021. As part of digitalization, the ministry of ICT Division of Bangladesh took projects for creating mobile apps for public services. Unfortunately, these apps are not currently working; only 100 apps were available in the play store at the time of data collection. This paper explores the behavior of app developers for understanding – why they are not working for the public services and removed from the play store. Data on app duration, size, update, download, and rating were collected from 100 government and 294 non-government apps in the Google Play Store on 15 October 2017. The analysis shows that the average rating of government apps is less than that of the apps developed by individual developers. Primarily, the causes are observed that the size and number of updates of the government apps are less than that of non-government. It is also observed that app size and number of its updates accelerate app rating and increase its usability. However, these are not the root causes; the study has identified the main cause that an aggressive developer developed the government apps of Bangladesh. This aggressive behavior of app development must underestimate the future of Digital Bangladesh, for example.

Keywords: Vission 2021, Digital Bangladesh, Mobile Apps, Government, Non-government and Aggressive Developers.

1.0. Introduction

Building 'Digital Bangladesh' in the global reality of globalization of information and communication technology was the demand of time. With response to that demand, Sheikh Hasina took oath as the

Prime Minister of Bangladesh Government on January 6, 2009, intending to build Bangladesh as a middle-income country and an IT-based 'Digital Bangladesh' in 2021, the year of Golden Jubilee of its independence. The Election Manifesto of her party, Bangladesh Awami League, described the political vision of Bangladesh for the year 2021 before winning the National Elections of 2008 (Albd.org, 2018). According to Wikipedia, *“Digital Bangladesh implies the widespread use of computers and embodies the modern philosophy of effective and useful use of technology in terms of implementing the promises in education, health, job placement, and poverty reduction. The government further emphasized the four elements of “Digital Bangladesh Vision,” which are human resource development, people involvement, civil services, and use of information technology in business.”*¹ The insight significance of 'Digital Bangladesh' is to bring up the country at the peak level of its development by increasing the use of digital devices, such as computers, phones, and the Internet.

Under the leadership of the same prime minister, the Awami League government has been leading the country for the last three consecutive terms prioritizing the vision 2021. Only one year remain in the hand of the government to achieve the goals of that digitalization process. Now, the question – how much the country has been digitalized in the last eleven years – is very much essential for us. Besides, how much human resources has been skilled in accessing the facilities of digitalization – is another crucial question. It has to be acknowledged that, in the last 11 years, much progress has been achieved in this regard. Many peoples of the country like peasants, small business persons, employees, and expatriates are getting access to that digitalization process. Multimedia classrooms have already been installed in thousands of primary schools and madrasa by the initiative of the government (The Financial Express, 2018a). About 62 thousands of model contents have been designed for children's education. According to official information, the computer lab has been set up in 3,722 schools and madrassas(The Daily Star, 2017). Some beneficiary stakeholders are claiming to increase the share of the ICT sector in the national budget. As a result, Bangladesh's government has also allocated the highest budget in the ICT and Education sector for the current fiscal year 2017-18 (Dhaka Tribune, 2017). It is right that employment is increasing for these types of ICT development, but there are not enough efficient and skilled human resources to reap the fruits of that development.

Still,uninterrupted power facilities (The Financial Express, 2018b) and quality training in the towns and remote areas are absent.² Due to the deficiency of proper maintenance, capable teachers, and skilled trainers, these ICT resources are being unused in many school-college-madrassas in remote areas. Along with this, there are many cases of abusing such ICT resources. Multimedia should be viewed as a support to learning and not as a substitute for good teaching or teacher.³ Disproportionate use of multimedia could cause serious adverse effects on the learning process, especially at a lower level of education. Lesha and Bushati (2015) argued that some students are unable to adapt to the freedom that multimedia, based on hypertext, enables⁴. Also, often, confusing presentation of material can cause blurring and conflicting messages. Unfortunately, from primary school to higher educational institutions, mathematics is not sometimes taught by hand-pen in the classroom, multimedia projectors are only used for presentation in Bangladesh!In some cases, multimedia projectors are being used as the means of finagling students in the classroom.

Not only the misuse of multimedia technology, Bangladesh still lacks the rational use of almost all ICT resources. For instance, the state’s Bangladesh Telecommunications Company Limited (BTCL) owned Bangla internet domain (.bangla) that it got from the Internet Corporation of Assigned Names and Number (ICANN) in 2016, has failed to garner much enthusiasm among users. As a result, Bangladesh is missing its presence in the international internet community, even by exploiting people’s emotions and losing the revenue earning opportunity (The Daily Star, 2020). Representing an overall

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¹https://en.wikipedia.org/wiki/Vision_2021

²<https://www.adb.org/sites/default/files/publication/203881/skills-dev-bangladesh.pdf>

³<http://raysummit.weebly.com/advantageslimitations-of-multimedia.html>

⁴<https://www.iasj.net/iasj?func=fulltext&aId=125056>

picture, the global ranking of the ICT development index has also echoed the reality of Bangladesh. As shown in **Figure 1**, though Bangladesh's rank in ICT development index (IDI) fluctuated substantially in recent years, it tended to increase through the 2002-2017 period ending at 147 rank out of 176 countries. Here rank 1 refers to a country that is highly developed. Moreover, the IDI value of Bangladesh was slightly increased to 2.53 in 2017 from 2.37 in 2016, while the top-ranked country Iceland had the value of 8.98 in 2017.

Aiming the much-talked digitization, the ICT Ministry of Bangladesh Government has taken many projects (The Daily Star, 2014; New Age, 2017). In the last 11 years, many projects have failed for different reasons. However, Bangladesh ICT Ministry has already taken various projects to strengthen the freelancing sector for earning foreign currency. Of the projects, the cost of the learning and earning project was 180 crores BDT (Anon, 2014). As part of the digitalization, the Department of ICT, in 2015, created 500 mobile apps, costing 9.5 million BDT (The Daily Star, 2015).

Figure 1: Bangladesh ICT Development Index During 2002-2017 (Source: World Data Atlas)⁵



To provide better services to the people, the government launched those mobile apps intending to achieve the new millennium development goal by 2021. The apps were supposed to be available in the Google play store and on an online platform which the government had been developing (The Daily Star, 2015). Anyone could search the applications putting the words, e.g., ‘National Apps Bangladesh’ and download those free. Unfortunately, a report titled "500 apps not working" came out in one of the top daily newspapers of Bangladesh on September 29, 2017.⁶ Then we checked the Google play store on 15 October 2017 and observed, only 100 government apps were available. The report illustrated that the apps had been removed nine months after being placed in the Google Play Store. In the absence of publicity, ordinary people do not even know about these apps. Since then, several other print and electronic media have been covering the issue. There are some works, which summarized methods for evaluating the content, usability, and efficacy of commercially available apps (for instance, Jake-Schoffman et al. (2015)). In this regard, Nayebi et al. (2016) surveyed developers and users and showed that half of the developers had cleared releasing strategies, and many experienced developers thought that releasing strategy affects user feedback. Users were not more likely to install apps based on release date or frequency of updates but preferred to use apps that have been infrequently, but recently, updated. Ruiz et al. (2016) conclude that the current store-rating of

⁵<https://knoema.com/MISR2018DEC/measuring-the-information-society-report-2018?tsId=1061730>

⁶<https://www.prothomalo.com/technology/article/1333856/%E0%A6%95%E0%A6%BE%E0%A6%9C%E0%A7%87-%E0%A6%86%E0%A6%B8%E0%A6%9B%E0%A7%87-%E0%A6%A8%E0%A6%BE-%E0%A7%AB%E0%A7%A6%E0%A7%A6-%E0%A6%85%E0%A7%8D%E0%A6%AF%E0%A6%BE%E0%A6%AA>

apps is not dynamic enough to capture the changing user satisfaction levels associated with the evolving nature of apps. This resilience is a significant problem that can discourage developers from improving the quality of their apps. Cravens (2012) researched *the* demographic and business model analysis of today's app developer. They showed only 35.1% of app reviews contain information that can directly help developers improving their apps. Moreover, for some popular apps, the volume of user reviews is too large to do manual checking on all of them.

We checked more kinds of literature, focusing on the issue. For example, Chen et al. (2014) researched informative mining reviews for developers from the mobile app marketplace. The encouraging results indicate that AR-Miner is effective, efficient, and promising for app developers. Harman et al. (2012) pointed out that an app marketplace is a new form of software repository and very different from traditional ones. They also analyzed the technical, customer, and business aspects of some apps in BlackBerry World. Linares-V´asquez et al. (2013) empirically demonstrated how the stability and fault-proneness of APIs used by some free Android apps relate to apps' lack of success. An exploratory study to analyze the user reviews crawled from the Apple App Store was conducted by Pagano et al. (2013). They studied the usage and impact of feedback through statistical analysis and the content of feedback via manual content analysis and frequent itemset mining. Palomba et al. (2015) studied how developers responding to user feedback can increase the ratings. Importantly, Viennot et al. (2014) did a large-scale characterization of Android apps in Google Play. More than 1.1 million Android apps were downloaded; and they explored issues such as app evolution, library usage, and duplicative app content and authentication scheme in Android apps.

We are motivated and inspired by Wang et al. (2017), who conducted a study of the mobile app ecosystem from the perspective of app developers. Based on over one million Android apps and 320,000 developers from Google Play, they investigated the Android app ecosystem from different aspects. Their analysis showed that while over half of the developers have released only one app in the market, many of them have released hundreds of apps. They classified developers into different groups based on the number of apps developers have released, and compared their characteristics. Mainly, they have analyzed the group of aggressive developers who have released more than 50 apps, trying to understand how and why they create so many apps of low quality. Unfortunately, there is no research by exploring the behavior of apps developers and assessing the performance of these government apps in Bangladesh.

Data on apps' size, update, download, duration, and rating in the Play store were collected from 294 non-government (individually and privately developed) and 100 government apps from the Google Play Store and AppBrain.com (2013). The general objective of the paper is to explore the behavior of apps developers for understanding – why the government apps are not working for public services and removed from the play store. Specifically, we want to know what factors like app size, update, download, and duration accelerate mobile app ratings for predicting the future of Digital Bangladesh, for example.

2. Methodology

2.1. Data Source and Variable Description

Data are collected from the Google play store and AppBrain.com (2013). Hundreds of apps developed by government initiatives are surveyed from the Google Play Store, where they were uploaded as “National Apps Bangladesh.” Another 294 apps developed by individual Bangladeshi developers are also surveyed from the same source. App data are collected on its duration in the play store, size (in megabyte), number of updates, number of downloads, and rating of the selected uploaded apps. Information on some variables related to the apps is not available in the Google Play Store. This information is collected from the appbrain.com. We have visited the apps one after another based on recommendations of the Google Play Store and collected the desired information on the selected variables on 15 October 2017. The Play Store provides recommendations by using a machine learning

process. The total app install/download is not in an exact figure; it is given in a range. We have assumed the upper limit of the range.

2.2. Study Design and Methods

We have designed the study in such a way where several dummies or categorical variables or attributes are created for our specific objectives. One dummy variable is created as ‘Govt./Non-Govt.’. An entertainment-non-entertainment dummy variable is created as ‘Enter./Non-Enter.’. If we categorize the surveyed apps as sector-wise, there are five categories like educational, agricultural, medical/healthcare, government ministry, and others. Note that we tried to take enough apps from each category. Since the sampling method is a purposive and machine-learning recommendation basis, we will not use any inferential statistics to find the significant factors which drive popularity (rating) of the apps. Somewhat descriptive statistics using tables and graphs will be enough to understand why they are not working for the public services and removed from the play store.

3. Result and Discussion

The following **Table 1** shows the descriptive statistics for app ratings, size, number of updates, number of downloads, and their duration in the play store by categorizing them into different dimensions. The government apps are rated less than the non-government apps. Whereas the average rating of non-government apps is 4.38 out of 5, the average rating of government apps is only 3.85. On average, there is no remarkable difference between entertainment and non-entertainment apps; entertainment-related apps have an average rating of 4.27 and 4.23 for that of non-entertainment apps.

Table 1: Average for apps rating, size, duration, update and download

		Rating	Size	Duration	Update	Download
IG/N	Govt.	3.855051	2.808343	36.67104	2.232323	10875.76
	Non Govt.	4.38	6.79	15.24	3.39	58,116.25
E/N	Enter.	4.27	5.92	16.80	3.76	62,974.18
	Non-Enter.	4.23	5.67	23.99	2.52	31,635.52
Sectors	Educ.	4.42	8.76	19.48	3.73	41,262.82
	Agri.	4.01	6.89	25.07	1.26	64,836.84
	Healthcare	4.35	3.71	24.76	0.92	7,254.23
	Ministry	3.93	2.78	32.62	2.41	7,738.64
	Others	4.25	5.49	17.87	3.42	58,334.44
General		4.25	5.79	20.65	3.09	46,185.61

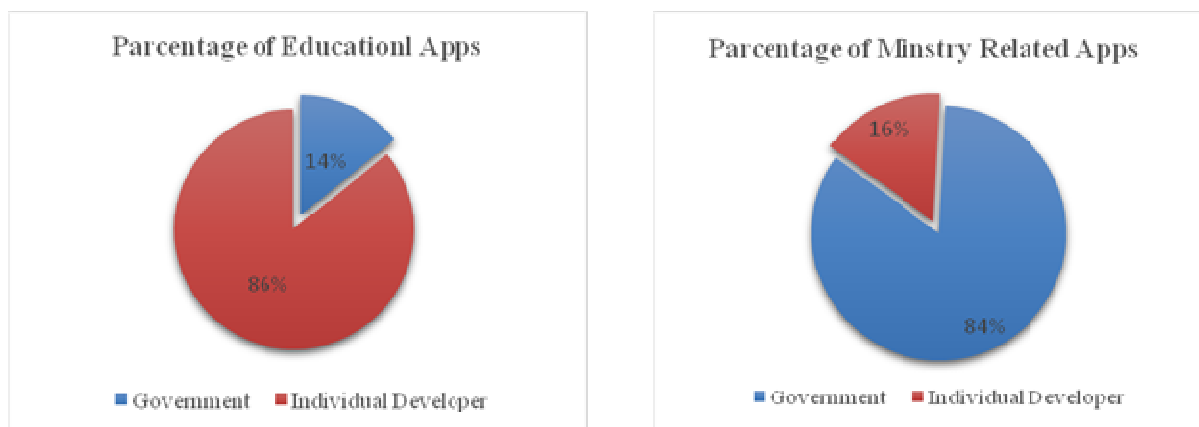
By the sectorial category, the average rating of ministry-related apps is 3.93, which is less than that of all other apps category. The highest average rating is 4.42, which is of related educational apps. The healthcare and agriculture-related apps are more popularly rated next to the educational apps. The average rating of the healthcare apps is 4.35, and 4.01 for the agricultural apps.

It also appears that the government apps are not rated enough because they are smaller in size, rarely updated, and downloaded in a smaller number. The average size of these government apps is 2.8 megabytes only. On average, they are updated only two times in 36 months. On the other hand, the average size of the 294 non-government apps is 6.79 megabytes, and the average number of updates is more than three within their averaged 15 months in the Google Play Store. The entertainment and non-entertainment apps are not much more different in size, but the entertainment apps are more updated and downloaded in a smaller period than that of non-entertainment apps. The more the size and the number of updates, the more the ratings of apps for all sectors except the healthcare. For example, the educational apps are larger sized, on average, updated more than four times and then rated more. As the ministry related apps are smaller sized and updated a fewer number of times, they are rated less

than others’ sectorial apps. It is also observed that app size and number of its updates accelerate app rating and increase its usability.

Interestingly, the highest-rated educational apps are larger sized, more updated, and downloaded in the shorter period compared to the lowest rated ministry-related apps. On the other hand, the apps developed by individual developers are also larger sized, more updated and downloaded in the shorter period compared to the apps developed by government initiative. So, size, updates, downloads, and duration in the Google play store do not directly seem to be the root causes of apps’ higher ratings and usability. **Figure 2** is presented for exploring the reason behind the fact that the education-related apps are rated the highest, and the ministry related apps the lowest. From the figure, it points out that, of the education-related apps, only 14 percent are developed by government initiative, and individual developers make the remaining 86 percent. The total number of ministry-related apps is 44; of them, only 7 (16 percent) apps are developed by individual developers, but the government develops the remaining 37 (84 percent).

Figure2: Percentage of government and individual developers of education and ministry-related apps



For comparison, McIlroy et al. (2015) studied update frequencies in the Google Play store and found that only 1% of studied apps received more than one update per week. They also found that rating was not affected by update frequency; however, the findings by Guerrouj et al. (2015) indicate that high code churn in releases correlates with lower ratings. Petsas et al. (2013) observe that paid apps follow a different popularity distribution than free apps, and show how free apps with an ad-based revenue strategy may result in higher financial benefits than paid apps. Comino et al. (2019) studied the top apps in Apple and Google stores, found that releases can boost user downloads. Zhong et al. (2013) examined the long tail of Google Play, which suggested that Google Play is more of a market strongly dominated by popular hit products than a “long-tail” market where unpopular niche apps aggregately contribute to a substantial portion of popularity.

Along with **Table 1** and **Figure 1**, the following **Figures 3 & 4** also summarize that the 100 government developed apps are less popular than the 294 non-government apps. Because the size of the government apps and their number of updates are much less than that of individually developed apps. Unfortunately, these are not the root causes; instead, they are the primary factors for the usability of apps. Another leading reason behind these reasons has come into focus in our research that only one developer produces these 100 government apps. The apps were developed by a single local company named Ethics Advanced Technology Ltd (EATLApps)(The Daily Star, 2015).

Figure 3: Boxplot of Rating, Size, Download and Number of Update as Categorized into Government and Non-government Apps

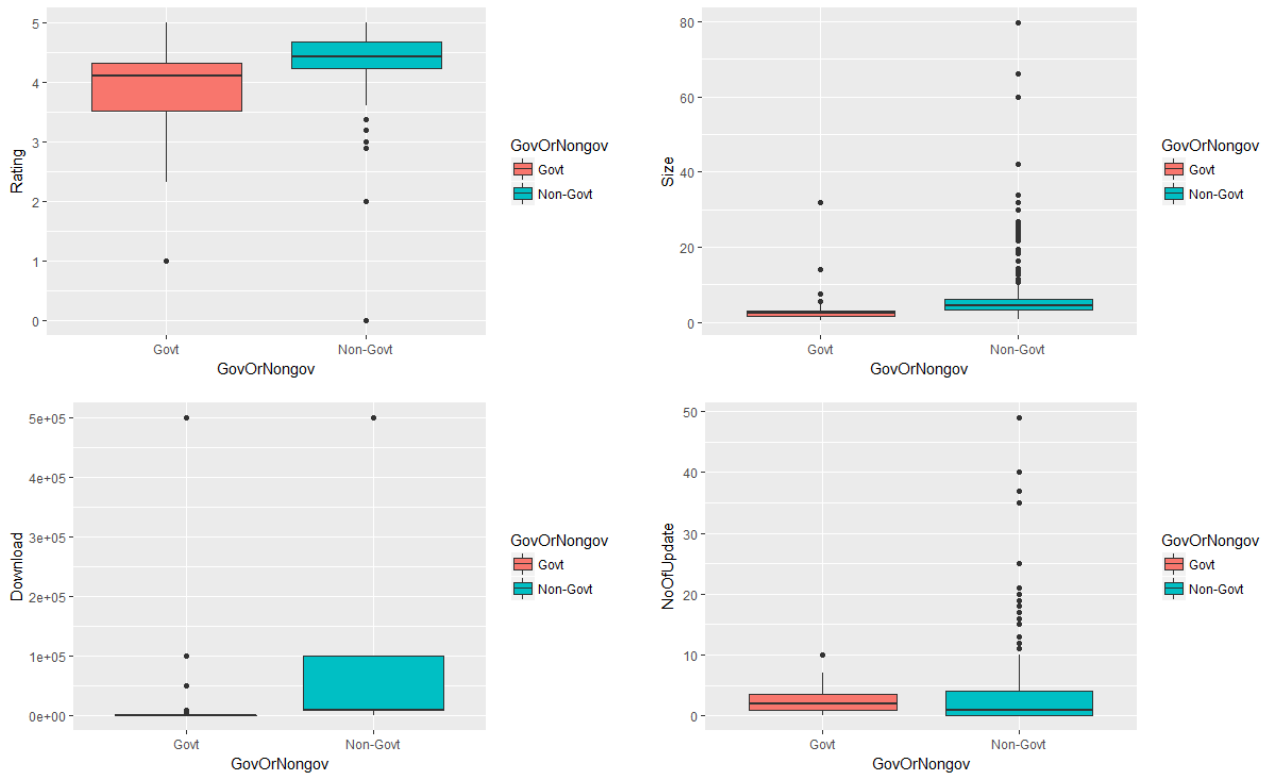
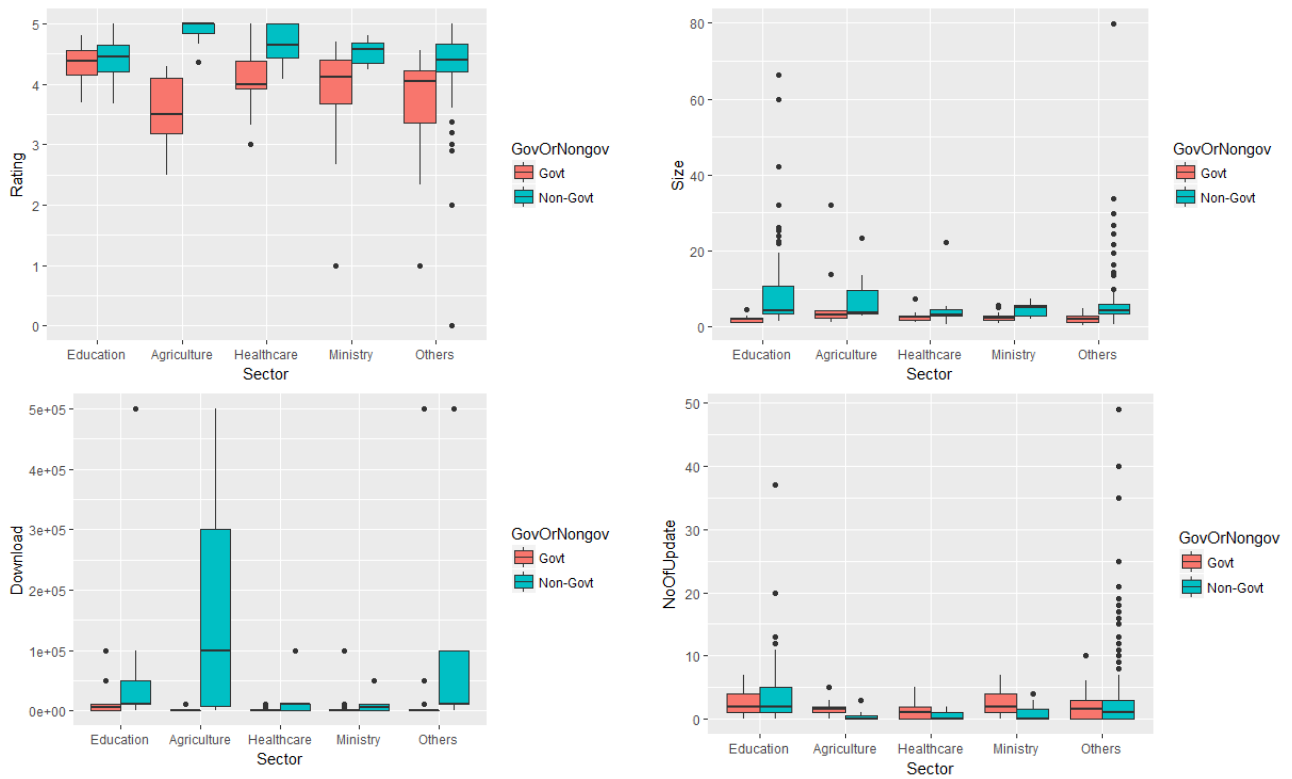


Figure 4: Boxplot of Rating, Size, Download and Number of Update as Categorized into Sectors and Government-Non-government Apps



Like Wang et al. (2017), we also treat this single developer as an aggressive app developer. It is to be noted that Wang et al. (2017) analyzed more than one million apps and 320,000 developer’s information, and shows that if a single company or a person creates more than 50 apps, they are called aggressive app developers. This type of app developers exerts a common trend in their characteristics for developing mobile apps. They use the same program code to design similar apps by just incorporating different information. These types of apps are generally poor in quality, and the usage and ratings remain lower than the useful apps. Since a single and aggressive developer develops all these hundreds of government apps in Bangladesh, it is not unusual that the quality and popularity of these apps are less than the individually developed apps. However, as in **Table 2**, only 16% of developers developed more than 50 apps each; each of the remaining 84% produced less than 50 apps among 294 non-government apps.

Table 2: Identification of aggressive developers of the non-government apps

App range in number	Percentage of developers
Less than 50 apps	84
More than 50 apps	16

Overall, each of the developers of non-governmental apps created less than 31 apps on average. So the individual developers are not aggressive developers on average; instead, they are active developers, and their developed apps are relatively accessible, superior, and more useful than that of the government apps of Bangladesh developed by an aggressive developer.

4. Conclusion and Recommendations

Assessing mobile apps popularity, performance, and exploring their developers behavior are not enough to predict the future of digital Bangladesh. However, towards building ‘Digital Bangladesh, mobile apps development is a vital part of making all types of services digital and secure access to people. Bangladesh's government has been taking several initiatives or projects to develop necessary mobile apps since 2014. Unfortunately, these apps are of low quality and being removed from the Google Play Store since the developers can not maintain the Google Play Terms of Service. Only 100 government apps are available in the play store at the time of data collection. So it is very much essential to understand why these government apps are of poor quality and less famous for future decision making and policy formulation. In these circumstances, our paper questions the behavior of app developers for predicting the future of much talked ‘Digital Bangladesh.’ Specifically, this paper is intended to know which factors drive the popularity or usefulness of mobile apps.

Data on apps’ size, update, download, rating, and duration in the play store are collected from 100 government and 294 non-government (individually or privately developed) apps from Google Play Store and appbrain.com on 15 October 2017. It is shown that apps size and the number of updates accelerate their rating and increase their usability with popularity. From all aspects, education-related apps are rated higher than in other sectors, especially ministry-related apps. These are the primary causes that positively drives apps rating and usability. However, these are not the root causes; the study has identified the main cause that an aggressive developer developed the government apps of Bangladesh. The rating of government apps is lesser than that of individually developed apps. Only one developer produces 100 government apps in Bangladesh. This aggressive behavior of app development must underestimate the future of Digital Bangladesh, for example.

On the other hand, individual developers are not an aggressive developer; that is why, on average, their developed apps are higher sized, more updated, popularly rated, and more useful than the government apps. Implementing hundreds of projects like the projects of developing low-quality and unpopular apps by aggressive developers is just a misuse of the vast amount of public money. So, not misusing such a significant amount of money, the government should make skilled manpower of

youths with proper training so that the youths themselves can develop a required number of high-quality, fashionable and useful apps like those of 294 individually developed apps. If there is any such opportunity, they will take it for their both fame and patriotism. As a result, they could bring their fruits to ordinary people by using the benefits of digitalization. Otherwise, the Bangladesh government could not manage to build the much-talked ‘Digital Bangladesh’ and achieve ‘Vision 2021’ in time, even at the cost of substantial public money.

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