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A Nuanced Understanding of ICT Access Divide among the Graduate Students in Bangladesh

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Abstract

This study explores the differences in types of access to ICT based on socioeconomic status among the graduate students in Bangladesh from material access perspective. Divides in material access i.e. more nuanced and complex understanding of access is getting priority where physical access gap has been almost bridged. Graduate students in Bangladesh are the most highly ICT-penetrated segment of the society where physical access i.e. mere access to Internet somehow has almost reached to saturation. Dearth of literature exists on material access divide among this segment of population. An online survey has been conducted with purposive sampling on the master's level students of three public universities in Bangladesh where 293 responses were received. Correlation and Chi-Square test reveal significant relationship between the level of socioeconomic status and device and connection opportunity, device diversity and Internet use frequency. Findings suggest that the higher the level of socioeconomic status of the respondent is, it is more likely to have better combination of devices, more devices, better connectivity to Internet and more frequent use. Findings of the study can be useful to the government agencies, international organizations, scholars and other stakeholders in understanding the nature of ICT access and use among this highly prospective segment of the population.

Keywords: ICT, Material access, Digital divide, Socioeconomic status (SES), Graduate students, Bangladesh

1. Introduction

It has been argued that saturation of Internet connectivity of a country or a segment of population within a country would solve the problem of digital divide of that country or that segment of population (Compaine, 2001; Sutherland, 2004). But, as connectivity reaching towards saturation in most of the high-income countries, scholars are focusing on more nuanced types

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of digital divides (Van Deursen & Van Dijk, 2019). Gap in access to ICTs more especially internet is considered as the first level of digital divide. Initially the access was viewed from the point of physical access meaning having some sort of access somehow or not having access in a binary manner (Selwyn, 2006). Later, scholars started exploring the nature of access and its consequences that were leading to differences in usage, skills and outcomes. From the perspective of a physical-access-saturated country Van Deursen and van Dijk (2019) argued that the divide in access was shifting from physical to material access that is a shift from mere access to a range of access in terms of access to multiple devices, peripherals and maintenance. Over the course of last two decades understanding of digital divide progressed from simple notion of physical access to more and more nuanced and complex areas of inequality from access to skills and usage to outcomes termed as first, second and third level of digital divide consecutively (Wei et al., 2011). Yet, the study of Van Deursen and Van Dijk (2019) identified the presence of the first level of digital divide in a high-income, internet saturated country, Netherlands, in the form of material access inequality. They argued that the first-level digital divide has shifted to material access gap from physical access inequalities.

Physical access divide among general population across various dichotomies like rich-poor, male-female, rural-urban etcetera is widespread in Bangladesh (BRAC Institute of Governance and Development & Bangladesh Rural Advancement Committee [BIGD-BRAC], 2018; GSM Association, 2019; Rashid, 2016; Ullah, 2017). However, there are some segments of population where physical access is no longer a problem. University students belong to this category of population as almost all of them have access to Internet predominantly through their smartphones or regular mobile phones and the main connection type is mobile data (Saha & Zaman, 2017; Nowrin & Bawden, 2018; Rashid et al., 2018).

This study explores the levels of material access to ICT from various dimensions to a high-ICT-penetrated segment of population of the country i.e. graduate students which has received very little attention from Bangladesh perspective. Moreover, the study also contributes in examining the relationship between socioeconomic status (SES) and material access divide and look for the answer whether SES can explain material access divide among the graduate students in Bangladesh. With this background, the study poses following research questions:

RQ1. To what extent graduate students in Bangladesh experience inequality in material access to ICTs in terms of quality and diversity of devices and Internet connections?

RQ2. Does SES explain the differences in quality and diversity of devices and Internet connections?

QR3. Is there any relationship between quality and diversity of devices and Internet connections and how frequently Internet is used?

2. Literature Review

With continuous innovations, smarter devices, software and Internet connectivity are coming every now and then creating differences in opportunities between who can afford to remain updated with smarter digital technology and who cannot. In this backdrop, concern is growing over material access divide and arguments going on that first level digital divide should get attention in terms of material access even where physical access is not an issue (Gonzales, 2016). Van Dijk (2005) argued that access to digital technologies is not as simple as it was being considered. He drew attention to the hierarchical nature of access from bare minimum to full range of access encompassing four successive kinds of access—motivational, material, skills, and usage.

2.1 Physical and Material Access

Scholars identified two dimensions of access: physical and material. Physical and material access have been defined as "Material access entails, on the one hand, physical access, or an Internet connection, whether at home or elsewhere, and on the other hand, expenses for hardware, software, and services" (Van Deursen & Van Dijk, 2015, p. 380). At present, a wide range of ICT devices, peripherals, Internet connectivity and softwares or apps are available for those who can afford. Moreover, the same kind of device or equipment comes in various capacities and configurations contributing to the differences in usage types, productivity and outcomes complicating the understanding of access even further. Three dimensions of material access divide identified: differences in device opportunities with lower and higher technical capacities, differences in device diversity (i.e. number of devices and peripherals one have) and differences in maintenance expenses (Van Deursen & Van Dijk, 2019).

Technical capacities of the devices differ widely and different devices have advantages and limitations. Two major types of devices are more prevalent among the users: mobile devices and computers. A survey in 11 developing

countries by Pew Research Center revealed that smartphones or phones that can be used to access Internet are the most prevalent and access to computer devices like desktop, laptop, tab are relatively rare in most of those countries (Silver et al., 2019). More widely used device type among the students of Bangladesh is smartphone (Nowrin & Bawden, 2018; Saha & Zaman, 2017) which has advantages like mobility, convenience, continuous and on the go internet connectivity, cheaper price (Mossberger et al., 2012), location services, gaming, and video streaming (Van Deursen & Van Dijk, 2019). But also mobile devices like smartphone and tab have a number of limitations in comparison with computer devices like desktop and laptop or notebook. Smartphones and tabs come with lower memory and storage capacity, less speed and less advanced applications (Akiyoshi & Ono, 2008; Mossberger et al., 2012), user's less control in Internet use while manufacturer's control is high (Napoli & Obar, 2014), less compatibility with protocols and standards (Murphy et al., 2016), smaller screen sizes demand more scrolling through the contents and making typing more difficult (Murphy et al., 2016; Napoli & Obar, 2014). Due to these limitations smartphone or tab cannot be used as effective alternative to computer devices (Van Deursen & Van Dijk, 2019). Both types of devices have different impact on the usage patterns and Internet outcomes of the users leading to a lower level user experience for the smartphone-only user in the nature of information searching, engagement with Internet, and content creation (Napoli & Obar, 2014). Therefore, mobile-only use could not ensure complete inclusion "because it was related to lower levels of skills and less diverse types of uses of the web compared to those people who also use the computer" (Correa et al., 2020, p. 1).

Usage of smartphones is more aligned to leisure purposes and computer devices are more work-oriented (Murphy et al., 2016; Pearce & Rice, 2013). Information searching in smartphones is superficial in nature and more immersive in computer devices (Humphreys et al., 2013; Isomursu et al., 2007). The key argument regarding device opportunity is that "some combinations of devices are less likely to be beneficial than others in providing a wider variety of Internet uses and outcomes" (Van Deursen & Van Dijk, 2019, p. 357). Having one type of device such as smartphone and missing others means missing the opportunities offered by those devices. General trend is that smartphone-only use is more prevalent among the groups belong to lower SES who are entitled to less social opportunities and considered as 'mobile underclass' (Napoli & Obar, 2014). As mobile devices and computer devices cannot be fully substitute of each other due

to limitations each type of device possess, it is plausible that those who can combine the desktops or laptops with smartphones or tab will enjoy broader range of opportunities (Van Deursen & Van Dijk, 2019). It is difficult to say some devices are better than others because each device has its advantages and disadvantages in performing specific tasks. Devices are more complementary than being alternative to each other. So, material access divide may arise from the "differences in the number of devices used for Internet access" (Van Deursen & Van Dijk, 2015, p. 380). Device diversity is the number of devices one possesses. More devices are more likely to offer better opportunities in using the Internet in a more diverse way and enjoy better digital experience (Donner et al., 2011).

2.2 SES and Material Access

Better devices, multiple devices and better quality internet connection with diverse options come with more prices. "Social and digital inequalities are intertwined and influence and reinforce each other" (Ragnedda et al., 2020, p. 811). Another study among university students in South Africa revealed the replication of social inequality pattern of the country in digital sphere also (Oyedemi, 2012, p. 302). So, it is expected that high income group will have better quality devices and peripherals and more devices (Jansen, 2010; Van Deursen & Van Dijk, 2019). Internet connectivity of lower income groups are usually unstable and prone to frequent disconnection (Gonzales, 2016), while higher income groups can opt for more expensive better quality Internet subscription (Van Deursen & Van Dijk, 2019). Lower income groups are more likely to be smartphone-only Internet users whereas high-income groups are more likely to have access to both smartphones and computer devices like desktops, laptops (Tsetsi & Rains, 2017).

2.3 Access Types and Internet Use

It is expected that access to better devices, more devices and better connectivity will lead to more frequent Internet use and better user experience. Material access to ICT is likely to impact the usage frequency and types of activities performed (Blank & Groselj, 2014; Van Deursen & Van Dijk, 2014).

Based on the literature discussed, a positive relationship is assumed between the level of SES and device opportunity, device diversity, and better and diverse connectivity. Moreover, it is also assumed that material access in terms of both types of devices i.e. computer (any of desktop or laptop/notebook or tab) and smartphone and both types of connections like WiFi at home along with having other type of connection i.e. mobile data

may lead to more frequent Internet use. Therefore, following hypotheses have been formulated:

H1: The higher the SES of a respondent is, it is more likely for him/her to have both smartphone and computer device (any of desktop or laptop/notebook or tab);

H2: The higher the SES is, it is more likely to have better Internet connectivity in terms of Wi-Fi Internet connectivity at home as the main connection type than mobile data or other connection types and more connection speed;

H3: The higher the SES is, it is more likely to have more devices and access to more connection types; and

H4: Since higher SES will lead to the possession of more and better devices and Internet connections, it is more likely for the higher SES respondents to use Internet more frequently.

3. Method

The study is a quantitative and exploratory in nature where data has been collected through an online sample survey using Google form and analyzed in SPSS. The survey was conducted for a month from mid-July to mid-August in the year 2020. Descriptive and inferential statistics, parametric and non-parametric tests have been used in analyzing data and testing hypotheses.

3.1 Participants

A total of 293 students studying at master's level in three public (state funded) universities in Bangladesh completed a questionnaire sent to their emails (mostly) and WhatsApp account (a few). Three universities are Begum Rokeya University, Rangpur (BRUR), University of Chittagong (CU) and Comilla University. Emails and or phone numbers of the students have been collected with the help of a teacher of the department or class representative. Questionnaires in Google From were sent to a total of 456 selected students of 45 departments of those three universities. The response rate was 64%. Department or major subject wise responses ranged from lowest one to highest 12. University wise responses received from BRUR 49 (16.7%), CU 169 (57.7%) and Comilla University 75 (25.6%). Overall, male-female ratio of the respondents was 182 (62.1%) and 112 (37.9%) respectively roughly closer to the gender ratio of those three universities. University-wise ratio of female respondents from CU was the highest (40%) and the lowest from BRUR (31%). Mean and median age of

the respondents was 24 with the range minimum 21 to maximum 27. From ethical perspective informed choice had been given and the participation in the survey was completely voluntary.

3.2 Measures

Socioeconomic status (SES) has been measured as a composite score of the following five variables: i) family income collected as a continuous measure then converted into 8 categories of ordinal measure (1 = lowest to 8 = highest); ii) student's own income collected as a continuous measure then converted into 4 categories ordinal measure (0 = no income to 3= highest); iii) Father's education collected as seven categories ordinal measure (0 = no formal education to 6 = Master's or higher level completed); iv) Mother's education collected as seven categories ordinal measure (0 = no formal education to 6 = Master's or higher level completed); and v) Student's Higher secondary level study location as 4 categories ordinal measure (1 = fully rural area to 4 = in a divisional city). Conceptually related two or more variables can be combined to form a composite variable (Song et al., 2013). Summing up the responses is practiced in creating composite score (Correa, 2016).

Device opportunity has been measured from three dimensions: a) using any type of computer devices like desktop or laptop or notebook or tab only; b) having smartphone only; and c) having a combination of both types of devices. For Internet connection: a) using Wi-Fi at home only; b) using mobile data only; c) using both Wi-Fi at home and mobile data. Following Van Deursen and Van Dijk (2015), device diversity has been measured as number of devices each respondent possessed collected as 'yes' or 'no' response on each item from a list of 10 types of devices. Internet use measured with 6-point answer options (rarely = 1 to almost always connected to Internet = 6) of the question 'How frequently do you use Internet?'

4. Findings

4.1 Devices and Internet Connection Types

Among the ICT devices respondents have, smartphone is the most widely available and the most commonly used device. Almost all of the respondents (99%) have a smartphone although 4.4% said that their smartphone was 'not suitable at all' for the activities they need or want to do. Moreover, 97.3% of the respondents used smartphone to access Internet and it was the most used ICT device of 86%. Laptop or notebook computer was the second most prevailing device which was owned by 67.6% and also used in accessing Internet by 50.2% of the respondents. Laptop or

notebook was also the second most used ICT devices for 8.9% of the respondents. Regular mobile phone was the third prevailing ICT device (29.4%) and the third most used device (4.1%). The third most used device to access Internet was the desktop computer (7.5%). Details on these and other devices have been presented in the **Table 1**.

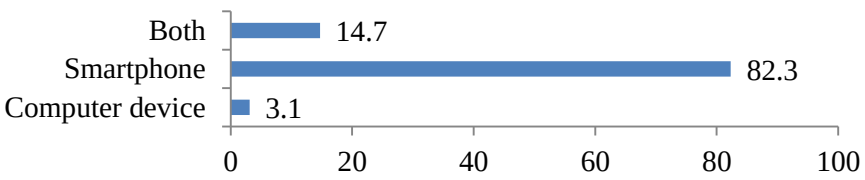
Table 1: *ICT Devices respondents possessed, most used ICT devices, devices used to access Internet*

ICT Devices	**ICT Devices respondents have*** Frequency (%)	**Devices used to access Internet*** Frequency (%)	**Most used ICT device** Frequency (%)
Smartphone	290 (99)	285(97.3)	252 (86)
Laptop/Notebook	198 (67.6)	147 (50.2)	26 (8.9)
Regular Mobile	86 (29.4)	17 (5.8)	12 (4.1)
Smart TV	50 (17.1)	15 (5.1)	--
Desktop	39 (13.3)	22 (7.5)	3 (1)
Tab	17 (5.8)	6 (2)	--
Music/Video player	18 (6.1)	1 (0.3)	--
Wearables	13 (4.4)		--
E-book reader	8 (2.7)		--
Game console	8 (2.7)		--

Source: Author's survey, *Multiple responses

While considering the devices used in accessing Internet mostly, as **Figure 1** shows, 82.3% respondents were smartphone dependent Internet users whereas the number of those accessed Internet in both computer device and smartphone were much lower (14.7%). Those who accessed Internet with computer devices (any of Desktop/Laptop/Notebook/Tab) mainly were very few (3.1%).

Figure 1: *Percentage of the respondents who identified themselves as computer device dependent, smartphone dependent or user of both types of devices for accessing Internet*



In the access to Internet connection, the largest number of the respondents (53.9%) had WiFi broadband Internet connection at home. Close to it was the 4G mobile data connection (50.5%). In third, fourth and fifth places were 2G/3G mobile data (42.7%), free WiFi at university (22.5%), and free WiFi at other places (8.2%) respectively. WiFi at home was also the mostly used internet connection type among the largest segment of the respondents (43%). Next to it were 2G/3G (25.6%) and 4G mobile data (25.3%) respectively. Free WiFi at university and other types of connections were accessed as mostly used connection types by 3.4% and 2.7% of the respondents respectively. In fact, mobile data was the most used Internet connection type of the majority (50.9%) of the respondents when 2G/3G and 4G mobile data were combined. Details on the connection types are shown in the **Table 2.**

Table 2: *Respondents' usually used Internet connection types and mostly used Internet connection type*

Internet connection types	**Usually used Internet connection types*** Frequency (%)	**Mostly used Internet connection type** Frequency (%)
Wifi at home	158 (53.9)	126 (43)
4G mobile data	148 (50.5)	74 (25.3)
2G/3G mobile data	125(42.7)	75 (25.6)
Free Wifi at University	66 (22.5)	10 (3.4)
Free Wifi at other places	24 (8.2)	8 (2.7)**

Source: Author's survey, *Multiple responses, **Other connection types

4.2 Device Suitability

As **Table 3** shows almost all (99%) owned a smartphone and majority (53.2%) said their smartphone was fully suitable for activities they needed or wanted to do. Another 41.3% thought their smartphone was somehow suitable and only a small portion (4.4%) considered their smartphone was not suitable at all. Around 82% of the respondents owned at least one of the four types of computer devices (Desktop/Laptop/Notebook/Tab) and 18.4% did not have any. Among those 82% who owned a computer device 39.2% said that their device was fully suitable, 38.9% thought somehow suitable and the rest of the 3.4% considered not suitable at all for the work they needed or wanted to do.

Table 3: *Suitability of smartphone or computer device (any of Desktop/Laptop/ Notebook/Tab) respondents owned for various uses*

	Having/not having / suitability of smartphone Frequency (%)	**Having/not having / suitability of computer device** Frequency (%)
Not suitable at all	13 (4.4)	10 (3.4)
Somehow suitable	121 (41.3)	114 (38.9)
Fully suitable	156 (53.2)	115 (39.2)
I do not have any	3 (1)	54 (18.4)

Source: Author's survey

4.3 Internet Connection Speed

Table 4 shows that largest segment of the respondents (39.6%) did not know the speed of the Internet connection type they used mostly. Among those who were aware of their connection speed, 19.8% enjoyed upto 10mbps, 17.4% upto 5mbps, 10.2% upto 15mbps and 13% more than 15mbps. Major portion of the respondents (41%) were 'somewhat satisfied' with the Internet speed they enjoyed and 20.1% were 'somewhat dissatisfied'. Percentage of the respondents 'very dissatisfied' with the speed was 12.3% and 'very satisfied' was 7.5%. Rest of the 19.1% was 'neither dissatisfied nor satisfied'.

Table 4: *Speed of respondents' mostly used Internet connection type and satisfaction with the speed of mostly used Internet connection type*

Internet connection speed	Frequency (%)	**Satisfaction with the speed**	Frequency (%)
I don't know	116 (39.6)	Very dissatisfied	36 (12.3)
Upto 5 mbps	51 (17.4)	Somewhat dissatisfied	59 (20.1)
Upto 10 mbps	58 (19.8)	Neither dissatisfied nor satisfied	56 (19.1)
Upto 15 mbps	30 (10.2)	Somewhat satisfied	120 (41)
More than 15 mbps	38 (13)	Very satisfied	22 (7.5)

Source: Author's survey

4.4 Nature of Support Availability

Table 5 shows that majority of the respondents (51.5%) sometimes faced problems that they could not solve themselves while using ICT. Another 17.1% faced problems frequently or very frequently. Among the rest of the respondents, 30.4% faced problem rarely and 1% never. Largest segment of the respondents (44.7%) turned to their friends and classmates for help when they faced problems that they could not solve themselves in using ICT. Other sought after supports were from online sources (38.6%), family members (11.6%), and professional service providers (4.1%). Getting

required support or services was somewhat easy to the largest segment (42%) of the respondents. Another 37.6% found it easy or very easy. However, getting required support or services was difficult or very difficult to 19.1% of the respondents.

Table 5: *Requirement of support/services and availability of support when respondents face problem that they cannot solve by themselves in using ICT in percent*

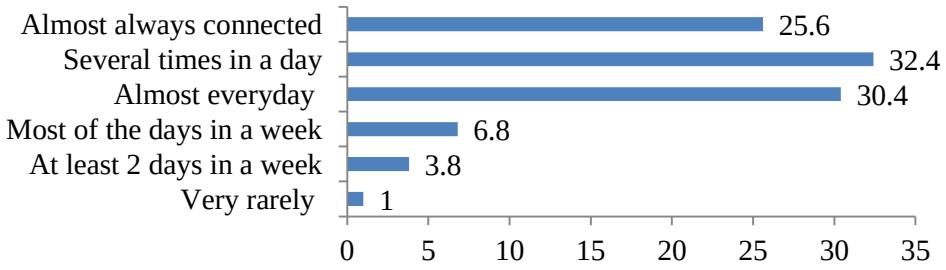
How frequently do you face such problem (N = 293)		**Whom you seek help/ Support** (N = 293)		**How easy or difficult to get help/support** (N = 293)	
Very frequently	5.5	Family members	11.6	Very difficult	3.1
Often	11.6	Friends & classmates	44.7	Difficult	16
Sometimes	51.5	Professional service providers	4.1	Somewhat easy	42
Rarely	30.4	Online sources	38.6	Easy	28.7
Never	1	I never face such problems	1	Very easy or never required	10.3

Source: Author's survey

4.5 Types of Internet Users

Figure 2 shows that most of the respondents (62.8%) were 'frequent' or 'very frequent' users who used Internet almost every day 89 (30.4%) or several times in a day 95 (32.4%). More than one fourth was 'extremely frequent user' who remained almost always connected to Internet 75 (25.6%). Rest of the respondents were 'non-frequent' users (11.6%) who used most of the days in a week 20 (6.8%), at least 2 days in a week 11 (3.8%) and very rarely 3(1%).

Figure 2: *Categories of Internet users based on the frequency of use of the respondents in percent*



5. Discussion

5.1 Device Opportunity

Device opportunity is the certain combination of the devices that contributes to better workability than other combination. For example, it is better to have a smartphone and a laptop or notebook than having a smartphone and a tab and a laptop and a notebook. Seventy two percent of the respondents (N = 293) conveys having both types of devices that is they have at least one of the computer device (desktop, laptop, and notebook computers) and at least one of the mobile devices (smartphone, tab and regular mobile phone). Rest of the respondents (28%) has only one type of devices either a smartphone or a desktop/laptop/notebook or a regular mobile phone. Smartphone is the most prevalent device almost all the respondents (99%) having it. Only one percent mentions that they 'do not have any smartphone' and 4.4% states that their smartphone is 'not suitable at all' for the work they usually do or intend to do. Among the rest of the respondents, 41.3% states that their smartphone is 'somehow suitable' and 53.2% says 'fully suitable'. So, the missing device type is computer device and those who cannot combine are missing the advantages of computer devices.

A positive correlation has been observed between composite measure of SES and device opportunity (i.e. having one type of devices only and both types of devices), $r(291) = .449$, $p < .001$. A cross tabulation by converting the SES score into three categories clearly shows that the higher the status is, it is more likely to have both types of devices. As **Table 6** shows, majority of the respondents (52.5%) from low SES have only one type of device whereas 94.9% of the respondents from high SES have both type of devices. The differences across categories are significant in Chi-Square test $\chi 2(2) = 50.106$, $p < .001$. Therefore, hypothesis **H1** has been accepted.

In the quality of Internet connection, there is also positive correlation between SES and mostly used connection type of the respondents $r(291) = .379$, $p < .001$. Those who scores higher in the SES are more likely to use Wi-Fi at home as their main connectivity option. From **Table 6** it is evident that 67.8% of the respondents from high SES use WiFi at home as mostly used Internet connection whereas the figure for low SES respondents is only 22.8%. More than three fourths (77.2%) of the respondents from low SES use other types of connections as their main connectivity option. Significant differences have been observed across categories in Chi-Square test $\chi 2(2) = 32.697$, $p < .001$. Moreover, respondents of higher SES are more likely to use speedier Internet connection. Majority of the high SES respondents (54.2%) use Internet connection which has more than 5mbps

speed. On the other hand, majority of the low SES respondents (51.5%) do not know what their connection speed is. Differences across categories are significant in Chi-Square test $\chi 2(4) = 11.150$, $p = .025$. Moreover, having Wi-Fi at home and having connection speed over 5mbps is positively correlated $r(291) = .387$, $p < .001$. These findings support hypothesis **H2** and thus accepted.

5.2 Device Diversity

While considering number of devices owned by each respondent, result shows that 22.2% selects only one device, 36.9% two devices, 20.8% three devices, 14.7% four devices, and 5.5% five or more devices. There is a positive correlation between SES and number of devices owned by the students $r(291) = .375$, $p < .001$. Cross tabulation between SES and number of devices owned by the respondents (**Table 6**) depicts an upward trend in the number of devices with elevated level of SES. The largest segment (44.6%) of the low SES possesses only one device where 62.7% of the respondents from high SES have three or more devices. The difference is significant in Chi-Square test $\chi 2(6) = 54.057$, $p < .001$. There is also a positive correlation between SES and using mobile data or WiFi at home or both as Internet connectivity $r(291) = .335$, $p < .001$. Cross tabulation between SES and usually used Internet connection types shows that higher the SES is, it is more likely to use both WiFi at home and mobile data connection. As **Table 6** shows, more than two-thirds (68.3) of the respondents from low SES usually use mobile data only while largest segment (42.4%) from high SES use both mobile data and WiFi at home. This variation across categories is significant in Chi-Square test $\chi 2(4) = 40.251$, $p < .001$. Therefore, hypothesis **H3** is accepted.

Table 6: *Cross tabulation and Pearson's chi square test between SES and various types of ICT access and Internet use*

	Socioeconomic status (SES)			
	Low	**Medium**	**High**	
Computer or smartphone or both				
Have one type of device	53 (52.5)	26 (19.5)	3 (5.1)	$\chi 2(2) = 50.106$, $p < .001$
Have both types of devices	48 (**47.5**)	107 (**80.5**)	56 (**94.9**)	
WiFi at home or other connection				
Other types of connection	78 (77.2)	70 (52.6)	19 (32.2)	$\chi 2(2) = 32.697$, $p < .001$
WiFi at home	23 (**22.8**)	63 (**47.4**)	40 (**67.8**)	
Speed of mostly used connection				
I don't know	52 (51.5)	47 (35.3)	17 (28.8)	$\chi 2(4) = 11.150$, $p = .025$
5mbps	17 (16.8)	24 (18.0)	10 (16.9)	
More than 5mbps	32 (**31.7**)	62 (**46.6**)	32 (**54.2**)	
Number of devices have				
One device	45 (44.6)	17 (12.8)	3 (5.1)	$\chi 2(6) = 54.057$, $p < .001$
Two devices	33 (32.7)	56 (42.1)	19 (32.2)	
Three devices	10 (9.9)	33 (24.8)	18 (30.5)	
Four or more devices	13 (**12.9**)	27 (**20.3**)	19 (**32.2**)	
Types of Internet connection				
Mobile data	69 (68.3)	52 (39.1)	13 (22.0)	$\chi 2(4) = 40.251$, $p < .001$
WiFi at home	8 (7.9)	28 (21.1)	21 (35.6)	
Both types	24 (**23.8**)	53 (**39.8**)	25 (**42.4**)	
How frequently Internet is used				
Non-frequent user	19 (18.8)	11 (8.3)	4 (6.8)	$\chi 2(6) = 29.278$, $p < .001$
Frequent user	41 (40.6)	38 (28.6)	10 (16.9)	
Very frequent user	24 (23.8)	52 (39.1)	19 (32.2)	
Extremely frequent user	17 (**16.8**)	32 (**24.1**)	26 (**44.1**)	

Source: Author's survey

5.3 Internet Use Frequency

Access to more and better devices and better Internet connections leads to more frequent Internet use. As **Table 7** shows that 65.9% of those who have both smartphone and computer are very frequent or extremely frequent users but very frequent or extremely frequent users are 37.8% among those who have only one type of device. The difference is

significant in Chi-Square test $\chi 2(3) = 19.602$, $p < .001$. Similarly, 69.7% of those who mostly use WiFi at home are very frequent or extremely frequent user but the percentage of very frequent or extremely frequent user among those who use other types of connections is 49.1% only. The difference is significant in Chi-square test $\chi 2(3) = 20.230$, $p < .001$. Moreover, percentages of extremely frequent users grew steadily with the elevating levels of SES from 16.8% for low SES, to 24.1% for medium SES and 44.1% for high SES respondents. The difference across categories are significant in Chi-Square test $\chi 2(6) = 29.278$, $p < .001$. So, hypothesis **H4** is accepted.

Table 7: *Cross tabulation and Pearson's chi square test between user type and device ownership (computer device/smartphone/ both) and mostly used Internet connection type*

User type	**Computer/ smartphone/ both** $\chi 2(3) = 19.602$, $p < .001$		**Mostly used connection type** $\chi 2(3) = 20.230$, $p < .001$	
	Any one type	**Both types**	**Other types**	**WiFi at home**
Non-frequent user	15 (18.3)	19 (9.0)	26 (15.6)	8 (6.3)
Frequent user	**36 (43.9)**	53 (25.1)	**59 (35.3)**	30 (23.8)
Very frequent user	19 (23.2)	**76 (36.0)**	54 (32.3)	41 (32.5)
Extremely frequent user	12 (14.6)	63 (29.9)	28 (16.8)	**47 (37.3)**

Source: Author's survey; *Note*: figures outside () are frequencies and inside are percentages

5.4 Limitations

The study contributes in understanding a rarely explored area of digital divide from Bangladesh perspective. However, it should be read and used considering its limitations. The main limitation of the study is that it is based on a purposive sampling which is not meant for generalization. This study did not cover some aspects of material access divide like maintenance expenses. Studies with nationally representative samples and including other aspects of material access divide are suggested for future research.

6. Conclusion

Although having an ICT device or being connected to Internet somehow or for some time is not an issue for the respondent graduate students, significant divide exists in material access to devices and connectivity. A significant portion is mobile dependent and missing the opportunities offered by computer devices. Moreover, a large portion is missing the advantages of being connected to high-speed Internet constantly in the form

of WiFi at home. There are other areas of divide in device, peripheral, and connectivity opportunity and diversity, qualities of devices and connection types, and support availability while facing problems in ICT use. SES has significant impact in creating many of these material access divides. These divides consequently determine how frequently and effectively Internet is used which may lead to divides in outcome achievement. With the existing material access divides, a large number of the students will not be able to develop their potential at optimum level for contributing in the goal achievement of the country in the ongoing fourth industrial revolution. Being the most potent segment of the population for building future Bangladesh, bridging the material access gaps among the graduate students should get proper attention from the policy makers.

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