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Received 1 July 2015
Revised 27 July 2015
Accepted 16 September 2015

Abstract

Purpose – This paper aims to investigate the use of smartphones for academic purposes by students at Dhaka University, the top-ranked university in Bangladesh.

Design/methodology/approach – Students currently using smartphones answered a questionnaire survey, which focused on whether or not students used smartphones for academic works and, if so, for what purposes they used them and their opinion on the advantages of using smartphones for academic purposes. Descriptive statistics were used to analyze demographic and academic characteristics of the students in relation to their smartphone usage. Non-parametric analyses were performed using Mann–Whitney and Kruskal–Wallis tests to compare between students' demographic and academic variables and their opinion on the advantages of academic use of smartphones.

Findings – The findings indicate that a vast majority of university students used smartphones for academic purposes. They, on average and across the board, had a positive perception toward academic use of smartphones. Although there were some differences in terms of gender, age, place of origin and duration of smartphone use, these differences were largely due to fact that a smartphone is a relatively new addition to the life of most students who participated in this study.

Originality/value – Research investigating the academic use of smartphones in the perspective of developing countries is virtually non-existent. This is the first time an effort has been made to examine the use of smartphones by a large sample of university students in Bangladesh.

Keywords Smartphones, Bangladesh, Developing country, Students, Academic use, Dhaka University

Paper type Research paper

1. Introduction

Smartphones have become an integral part of the daily life of many university students, even in developing countries such as Bangladesh. These devices allow users not only to make and receive phone calls or text and voice messages, but also to run a wide variety of productivity and convenience applications, popularly known as *apps*. Running on mobile operating systems, today's smartphones provide advanced computing capabilities and connectivity options in a manner similar to traditional computers. These features enable new kinds of mobile apps that in turn shape the usage habits of smartphone users (Alfawareh and Jusoh, 2014). Studies have identified that students are increasingly using a diverse range of academic apps to support their learning needs (Woodcock *et al.*, 2012). As smartphone apps continue to evolve, they have the capability of contributing to student learning and improving academic achievements.

A smartphone provides students with immediate, portable access to many of the similar education-enhancing capabilities as an internet-connected computer, such as

The Electronic Library
Vol. 34 No. 4, 2016
pp. 651-665

0264-0473
DOI 10.1108/EL-07-2015-0112

online information retrieval, file sharing and interacting with professors and classmates (Bull and McCormick, 2012; Tao and Yeh, 2013). The results from a recent ECAR survey (Dahlstrom, 2012) showed that 67 per cent of US undergraduate students' smartphones and tablets were used for academic purposes. An even more recent study (Bomhold, 2013) found that 76 per cent of undergraduate students used smartphone apps to find academic information at a US university. Although smartphones are common among university students in Bangladesh, research investigating their use in an academic context is virtually non-existent. Thus, the purpose of the present study was to investigate the use of smartphones for academic purposes by a large sample of university students in Bangladesh.

2. Literature review

There is a great deal of current research on the use of mobile devices and smartphones for accessing information and services (Bomhold, 2013; Lepp *et al.*, 2013, 2015a, 2015b). However, only a few empirical studies are available on the academic use of smartphones, especially with the perspective of university settings in developing countries.

Nam (2013) surveyed how students at a university in South Korea use their smartphones. Based on data from 135 participants, the most frequent and usual usages of smartphones were analyzed. The study evaluated students' perceived satisfaction with smartphone use in terms of their gender and academic year. The results indicated that the most frequent and usual usage of smartphones was for real-time communication, rather than as a telephone or for internet searches. On the other hand, students' usage for study received the lowest rate of response in both categories of uses. Although the study found few significant differences in terms of gender, there was also no statistical difference in perceived satisfaction toward smartphone usage between academic years of the participants.

Bomhold (2013) described the educational use of smartphone technologies, particularly mobile apps, by undergraduate university students enrolled in an information literacy course. This study found that the most frequently used app categories were "social and communication", "search engines", "tools and productivity", "games or music", "sports or other entertainment" and "reference or libraries". The apps that had little use or no ownership included "hobbies", "casual reading", "finance and banking" and "shopping". Although the use of search engines was very low (only 10.4 per cent) among the most frequently used apps, they were used by the students most frequently to find academic information. A significant number (75.0 per cent) of students reported using apps to find academic information. The findings of this study revealed that the academic apps that the students used most often were familiar to them, and these apps allowed portable access to popular academic websites that students generally access on their personal computers.

Alfawareh and Jusoh (2014) studied the trends in smartphone use among students in a university in Saudi Arabia. A total of 324 students from various academic levels and programs participated in a questionnaire-based survey. The survey found that 94.4 per cent of the participants owned smartphones. Based on these data, the trends were evaluated by categorizing usage into two types: normal usage and usage for learning. The results indicated that a majority of students used their smartphones as a regular mobile phone, as a computer with an internet connection and as a digital camera. To study the trends in smartphone usage for learning, questions relating to learning

activities, such as logging in to academic portals, using Blackboard, downloading class materials and taking and recording lecture notes, were asked. It was found that 91.7 per cent of the students used smartphones to log in to their academic portal. The results also indicated that 60.9 per cent of the participants never used their smartphones for Blackboard, 66.0 per cent of the students never used their smartphones as a means for taking notes in a classroom and 66.9 per cent of the participants never used their smartphones to record class lectures.

Bangladesh is one of the fastest-growing mobile phone markets in the world. According to the Bangladesh Telecom Regulatory Commission (BTRC), the total number of mobile subscriptions has risen from 122,657 million in February 2015 to 125,971 million in May 2015 (BTRC, 2015). It was reported that the growth in smartphone sales in Bangladesh, especially in Dhaka, is much higher than the global average, and smartphone sales account for more than 20 per cent of the total handset sales in the country (Rahman, 2015). Located at the heart of Dhaka, the Dhaka University campus, with a population of nearly 33,000 students, is believed to have one of the largest concentrations of academic smartphone users in Bangladesh. Nonetheless, there has been no reported research that objectively investigated whether and to what extent the students use smartphones as learning tools at the university level in Bangladesh. This present paper attempts to explore the use of and perceptions of the Dhaka University students for accessing academic information through their smartphones.

3. Study purpose and research questions

Recent research studies, as well as the popular literature, indicate that the use of smartphones has been on the rise in recent years, particularly among university students. These devices are typically used for entertainment and social networking (Lepp *et al.*, 2013, 2015a, 2015b; Salesforce, 2014; Smith, 2015). Smartphones are relatively new in the technology world, and there has been little empirical research on their academic use in university settings. The study reported here was designed to gather evidence of the current use of smartphones by students, as well as their perceptions of the advantages of using them in their academic work, from a developing country perspective. For this current study, the following research questions were investigated:

RQ1. Do university students use smartphones for academic purposes?

RQ2. For what academic purposes do they use their smartphones?

RQ3. What is their opinion with regard to the advantages of academic use of their smartphones?

RQ4. Are there any significant differences among the student groups in terms of their gender, academic level, age and/or place of origin in regard to their opinion on the benefits of academic use of their smartphones?

4. Study methodology

4.1 Questionnaire design and data collection

This paper examines the use of smartphones for academic purposes by students at Dhaka University, the top-ranked university in Bangladesh. The data for this study were collected over a period of 2 months, between August and September 2014. Only

those students who had been using their smartphones at that time were asked to respond to a questionnaire survey about their usage. The questionnaire was segmented into three sections. The first section was designed to obtain the students' demographic and academic data; the second part contained questions about whether or not they used smartphones for academic works and, if so, for what purposes they used them; and the third section asked about their perceptions of and opinion on statements pertaining to academic use of smartphones. A total of 333 questionnaires were distributed individually among students with smartphones at different faculties and institutes across the Dhaka University campus, of which 316 (98.9 per cent) completed questionnaires were returned. A copy of the questionnaire is available in Appendix 1.

4.2 Data analysis procedures

The collected data were entered into IBM SPSS Statistics for analysis. To address the research questions, descriptive statistics were obtained to examine the students' demographic and academic data in relation to their smartphone usage. Due to the ordinal nature of the data obtained through a seven-point Likert-type scale (from 1 being the lowest to 7 being the highest) on the educational advantages of smartphones, various non-parametric analyses were performed to compare the differences between the students' demographic and academic variables and their perspectives on the advantages of academic use of smartphones. Mann–Whitney (M-W) U tests were used to compare the students' opinion with regard to the advantages of smartphone usage by their gender and academic level. The M-W statistics was used because it is the most suitable method for testing skewed ordinal data between two independent groups. This test was also useful because it assesses whether the mean rank from one group differs from the mean rank of the other group. The null hypothesis tested is that there is no difference between the groups in terms of their opinions on the advantages of academic use of smartphones. If the p value is less than 0.05 ($p < 0.05$), the null hypothesis is rejected. Otherwise, the null hypothesis is accepted to conclude that there is no difference between the groups. Similarly, Kruskal–Wallis (K-W) tests are an extension of the M-W test to three or more groups. The K-W tests were conducted to compare the students' opinions by their age, place of origin and duration of smartphone use.

5. Results of the study

The survey focused on whether or not the students use smartphones for academic work and, if so, for what purposes they used them and their perspectives on various academic applications of smartphones. The findings are reported below, arranged by the research questions of the study.

5.1 Academic and demographic information of participants

A total of 316 students participated in the survey. As shown in Table I, the largest group (110, 34.8 per cent) of students was from the faculty of arts. The next largest group (58, 18.4 per cent) was from the faculty of business studies, followed by those from the faculty of social sciences (49, 15.5 per cent), faculty of science (34, 10.8 per cent), faculty of biological sciences (19, 6.0 per cent) and various institutes (14, 4.4 per cent). There was the same number of respondents (8, 2.5 per cent) from the faculties of law and of pharmacy each. The lowest number of responses (4, 1.3 per cent) came from the faculty of earth and environmental sciences. It is important to note here that the number of

respondents from some of the faculties/institutes was very small and, therefore, the data obtained may not be representative.

As shown in Table II, more than half of the respondents (173, 54.7 per cent) were postgraduate students. The rest of the participants (143, 45.3 per cent) were undergraduate students.

Among the students, the largest group (221, 69.9 per cent) was from the 21–24-year age group. The next largest group (70, 22.2 per cent) was from the 17–20-year age group, followed by those from the 25–29-year age group (25, 7.9 per cent) (Table III).

Dhaka University students come from various places across Bangladesh. As can be seen in Table IV, the largest proportion of participants (175, 55.0 per cent) was from rural areas; thus, more than half of the students were from the rural parts of the country. The next largest group (73, 23.1 per cent) was from small towns, followed by those who hailed from cities (41, 13.0 per cent) and major metropolitan cities (28, 8.9 per cent).

5.2 Brands and duration of smartphone use by participants

There are a number of smartphone brands available on the Bangladesh market, ranging from Samsung to Symphony to local brands such as Walton. Although some of the smartphone models are as cheap as BDT 3,700–4,000 (around US$50), they share,

Table I. Participating university students (n = 316), by faculty/institute and gender

Faculty/institute	Male	(%)	Female	(%)	Total	(%)
Arts	74	23.4	36	11.4	110	34.8
Social sciences	36	11.4	13	4.1	49	15.5
Law	7	2.2	1	0.3	8	2.5
Biological sciences	18	5.7	1	0.3	19	6.0
Business studies	47	14.9	11	3.5	58	18.4
Science	31	9.8	3	0.9	34	10.8
Pharmacy	7	2.2	1	0.3	8	2.5
Engineering and technology	11	3.5	1	0.3	12	3.8
Earth and environmental sciences	4	1.3	0	0.0	4	1.3
Institutes	11	3.5	3	0.9	14	4.4
Total	246	77.8	70	22.2	316	100

Table II. Participating university students (n = 316), by academic level and gender

Academic level	Male	(%)	Female	(%)	Total	(%)
Undergraduate	130	41.1	13	4.1	143	45.3
Postgraduate	116	36.7	57	18.1	173	54.7
Total	246	77.8	70	22.2	316	100

Table III. Participating university students (n = 316), by age group and gender

Age group	Male	(%)	Female	(%)	Total	(%)
17–20	50	15.8	20	6.4	70	22.2
21–24	172	54.4	49	15.5	221	69.9
25–29	24	7.6	1	0.3	25	7.9
Total	246	77.8	70	22.2	316	100

relatively, the same features and functionalities. Among the participants, the largest group (83, 26.3 per cent) used Symphony mobiles. The next largest group (73, 23.1 per cent) used Samsung, followed by those who used Nokia and Walton each (65, 20.6 per cent) and other smartphone brands (24, 7.6 per cent). The data indicated that only a few respondents (6, 1.9 per cent) used Apple phones, as they are more expensive than the others (Table V).

As shown in Table VI, the largest group (90, 28.5 per cent) of students had been using smartphones for from 6 months to 1 year. The next largest group (87, 27.5 per cent) had been using smartphones for 1–2 years, followed by those using them for 1–6 months (83, 26.2 per cent) and 2–3 years (32, 10.1 per cent). Only a few students (24, 7.6 per cent) had been using smartphones for more than 3 years at the time of this study.

5.3 Mode, frequency and preferred search engine to access the internet

All respondents indicated that they used the internet on their smartphones. As shown in Table VII, the largest group of participants (217, 68.7 per cent) accessed the internet via both mobile network and Wi-Fi connections. The next largest group (53, 16.8 per cent) used only Wi-Fi networks for accessing the internet, followed by those who accessed the internet only through their mobile networks (46, 14.5 per cent). More than half of the

Table IV. Participating university students ($n = 316$), by place of origin and gender

Place of origin	Male	(%)	Female	(%)	Total	(%)
Rural area	153	48.4	21	6.6	174	55.0
Small town	49	15.5	24	7.6	73	23.1
City	22	7.0	19	6.0	41	13.0
Major metropolitan city	22	7.0	6	1.9	28	8.9
Total	246	77.9	70	22.1	316	100

Table V. Participating university students ($n = 316$), by smartphone brands and gender

Smartphone brands	Male	(%)	Female	(%)	Total	(%)
Nokia	49	15.5	16	5.1	65	20.6
Samsung	56	17.7	17	5.4	73	23.1
Walton	49	15.5	16	5.1	65	20.6
Apple	6	1.9	0	0.0	6	1.9
Symphony	67	21.2	16	5.1	83	26.3
Other	19	6.0	5	1.6	24	7.6
Total	246	77.8	70	22.1	316	100

Table VI. Participating university students ($n = 316$), by smartphone use and gender

Smartphone use	Male	(%)	Female	(%)	Total	(%)
1–6 months	62	19.6	21	6.6	83	26.2
6 months–1 year	67	21.2	23	7.3	90	28.5
1–2 years	71	22.5	16	5.1	87	27.6
2–3 years	27	8.5	5	1.6	32	10.1
More than 3 years	19	6.0	5	1.6	24	7.6
Total	246	77.8	70	22.2	316	100

students (190, 60.1 per cent) also indicated that they used their smartphones as mobile Wi-Fi hotspots to connect other devices, such as a tablet or laptop, to the internet.

Table VIII shows that the largest group (197, 62.3 per cent) of students accessed the internet a few times every day using their smartphones. The next largest group (70, 22.1 per cent) used the internet at least once a day, followed by those who accessed the internet a few times a week (25, 7.9 per cent), at least once a week (13, 4.1 per cent) and at least once a month (9, 2.8 per cent).

Among the participants, the largest group (203, 64.1 per cent) used Google as their preferred search engine. The next largest group (97, 30.7 per cent) used Opera, followed by those who used Yahoo! (10, 3.2 per cent) and Ask.com (2, 0.6 per cent). The remaining respondents (4, 1.3 per cent) used other search engines for accessing the internet (Table IX).

5.4 Type of information accessed by participants

To inquire about the type of information accessed through their smartphones (Table X), the largest number of respondents (207, 65.5 per cent) indicated that they used them for accessing academic information, followed by those who used them for reading news (200, 63.3 per cent), accessing social media sites (190, 60.1 per cent), obtaining sports news (129, 40.8 per cent), for entertainment (120, 37.9 per cent) and listening to music

Mode of internet access	Male	(%)	Female	(%)	Total	(%)
Mobile network	36	11.4	10	3.1	46	14.5
Wi-Fi	42	13.3	11	3.5	53	16.8
Both	168	53.2	49	15.5	217	68.7
Total	246	77.9	70	22.1	316	100

Table VII. Participating university students ($n = 316$), by mode of internet access and gender

Frequency of internet access	Male	(%)	Female	(%)	Total	(%)
A few times every day	164	51.9	33	10.4	197	62.3
At least once a day	47	14.9	23	7.4	70	22.3
A few times a week	20	6.3	5	1.6	25	7.9
At least once a week	7	2.2	6	1.9	13	4.1
At least once a month	7	2.2	2	0.6	9	2.8
Other	1	0.3	1	0.3	2	0.6
Total	246	77.8	70	22.2	316	100

Table VIII. Participating university students ($n = 316$), by frequency of internet access via smartphone and gender

Preferred search engine	Male	(%)	Female	(%)	Total	(%)
Google	162	51.3	41	12.9	203	64.1
Opera	73	23.1	24	7.6	97	30.7
Ask Jeeves	0	0.0	2	0.6	2	0.6
Yahoo!	7	2.1	3	0.9	10	3.2
Other	4	1.3	0	0.0	4	1.3
Total	246	77.8	70	22.2	316	100

Table IX. Participating university students ($n = 316$), by preferred search engine and gender

(119, 37.6 per cent). A few participants (11, 3.5 per cent) noted that they used their smartphones for other purposes.

When asked what types of academic information students seek via their smartphones (n = 207), the largest group (155, 74.9 per cent) stated that they read full-text articles. The next largest group used them for watching learning videos (117, 56.5 per cent), followed by those who used smartphones for recording class notes (94, 45.4 per cent), preparing class notes (75, 36.2 per cent) and for library reference (48, 23.2 per cent). The rest of the students (11, 5.3 per cent) gathered other academic information through their smartphones (Table XI). Among all the participants, the vast majority (283, 89.5 per cent) was interested in downloading apps on their smartphones for academic use.

5.5 Frequency of agreement with statements and importance of smartphones

Regardless of whether the participants use their smartphone for academic purposes or not, there was a highly favorable agreement across the board with regard to statements about smartphones being used for academic work. Overall, the respondents were very positive about the possibility of using smartphones for academic purposes (Table XII).

Again, from the results presented in Table XIII, it is indicated that the largest group (125, 39.5 per cent) of students stated that smartphones are "important" for academic purposes. The next largest group (84, 26.6 per cent) thought that they are "moderately important" for academic work, followed by those who indicated that smartphones are "extremely important" (80, 25.3 per cent). Only a few students felt that they are either "not very important" (24, 7.6 per cent) or "not at all important" (1, 0.3 per cent) for academic work. Two students (0.6 per cent) were unsure about the academic use of smartphones.

Table X. Participating university students (n = 316), by type of information accessed via smartphone and gender

Type of information accessed	Male	(%)	Female	(%)	Total	(%)
Academic	168	68.3	39	55.7	207	65.5
Sports	116	47.2	13	18.6	129	40.8
News	179	72.8	21	30.00	200	63.3
Music	99	40.2	20	28.6	119	37.7
Social networking sites	151	61.4	39	55.7	190	60.1
Entertainment	93	37.8	27	38.6	120	38.1
Other	10	4.1	1	1.4	11	3.5

Table XI. Participating university students (n = 207), by type of academic information used and gender

Type of academic information	Male (n = 168)	(%)	Female (n = 39)	(%)	Total (n = 207)	(%)
Reading full-text articles	129	76.8	26	66.7	155	74.9
Recording class notes	66	39.3	28	71.8	94	45.4
Preparing class notes	64	38.1	11	28.2	75	36.2
Learning video	101	60.1	16	41.0	117	56.5
Library references	32	19.1	16	41.0	48	23.2
Other	8	4.8	3	7.7	11	5.3

5.6 Opinion on advantages of academic use of smartphone by participants

The students were asked to rate their opinion on the benefits of using smartphones for academic purposes. The results of this analysis, shown in Table XIV, indicated that the students, on average and across the board, responded favorably to the degree to which smartphones could be used in their academic work, with the greatest benefit coming in the form of searching for relevant information. They also showed positive perceptions of the usefulness of smartphones in increasing their knowledge base, study skills and other benefits.

5.7 Comparison of students' opinion by gender and academic level

Table XV shows the results of a M-W *U* test of the comparison between male and female students in terms of their opinion on the advantages of academic use of smartphones presented in Table XIV. The test results found that there were significant differences in six out of seven scores. The mean rank scores for female students was low across all statements, suggesting they were comparatively less sure about the benefits of using

Frequency of agreement	Male agreeing (n = 246)	(%)	Female agreeing (n = 70)	(%)	Total agreeing (n = 316)	(%)
Facilitate learning Yes/No	241	98.0	65	92.9	306	96.8
Save time and increase productivity Yes/No	223	90.7	65	92.9	288	91.1
Skill development and training Yes/No	224	91.1	64	91.4	288	91.1
Finding up-to-date information Yes/No	241	98.0	69	98.6	310	98.1

Table XII. Participating university students (n = 316), frequency of agreement with various statements about academic use of smartphones by gender

Importance of smartphones for academic work	Male	(%)	Female	(%)	Total	(%)
Extremely important	69	21.8	11	3.5	80	25.3
Important	91	28.8	34	10.8	125	39.6
Moderately important	64	20.3	20	6.3	84	26.6
Not very important	21	6.6	3	0.9	24	7.6
Not at all important	0	0	1	0.3	1	0.3
Do not know	1	0.3	1	0.3	2	0.6
Total	246	77.84	70	22.15	316	100

Table XIII. Participating university students (n = 316), opinion on the importance of smartphones for academic purposes by gender

Student opinion	Mean (SD)
Makes it easier to search for information relevant to my studies	4.8 (1.67)
Improves my study skills	4.5 (1.54)
Makes it easier to access and complete my studies	4.5 (1.50)
Makes it easier to participate in class-related discussions	4.5 (1.59)
Increases my knowledge in my field of study	4.7 (1.46)
Increases my motivation toward completing my studies	4.4 (1.62)
Overall academic quality	4.7 (1.50)

Table XIV. Participating university students (n = 316), mean (standard deviation) scores of opinion on advantages of academic uses of smartphones (on a seven-point scale)

smartphones in academic work. Results of a separate M-W U test indicated that undergraduate and postgraduate students did not differ significantly in terms of their opinion on the academic benefits of smartphones.

5.8 Comparison of students' opinion by age, place of origin and duration of smartphone use

Table XVI reveals the results of a K-W test for differences among age groups in terms of their opinion on using smartphones for academic work. The results indicated that there were no significant differences in three out of seven scores. The mean rank scores of older students (i.e. 25–29 years) were higher than other age groups, indicating they were more favorable toward the academic use of smartphones.

Results of a K-W test comparing among the students on their opinion on the advantages of academic use of smartphones by their places of origin suggested that there were significant differences in five out of seven cases (Table XVII). Students from metropolitan cities had higher mean rank scores than students from other regions, indicating they were more positive than others about the academic use of smartphones.

A separate K-W test indicated that there were no significant differences in terms of students' duration (months/years) of smartphone use and their opinion on academic

Table XV. Participating university students ($n = 316$), M-W U test result for opinion on advantages of using a smartphone for academic purposes by gender

Student opinion	M-W U	Wilcoxon W	z value	Asymp. sig. (two-tailed)
Makes it easier to search for information relevant to my studies	6,655.5	9,140.5	−2.947	0.003*
Improves my study skills	7,017.0	9,502.0	−2.410	0.016*
Makes it easier to access and complete my studies	7,344.0	9,829.0	−1.913	0.056
Makes it easier to participate in class-related discussions	7,117.0	9,602.0	−2.255	0.024*
Increases my knowledge in my field of study	6,745.0	9,230.0	−2.824	0.005*
Increases my motivation toward completing my studies	7,143.5	9,628.5	−2.211	0.027*
Overall academic quality	7,174.5	9,659.5	−2.176	0.030*

Note: *Significant at $p < 0.05$

Table XVI. Participating university students ($n = 316$), K-W test result for opinion on advantages of using a smartphone for academic purposes by age

Student opinion	χ^2	df	Asymp. sig.
Makes it easier to search for information relevant to my studies	3.499	2	0.174
Improves my study skills	6.020	2	0.049*
Makes it easier to access and complete my studies	6.600	2	0.037*
Makes it easier to participate in class-related discussions	2.394	2	0.302
Increases my knowledge in my field of study	6.916	2	0.031*
Increases my motivation toward completing my studies	6.283	2	0.043*
Overall academic quality	3.765	2	0.152

Note: *Significant at $p < 0.05$

applications, except for searching for relevant study information ($\chi^2 = 13.554$, df = 4, $p = 0.009$). The mean rank score of students having 2–3 years of smartphone use was comparatively higher than the other groups, indicating they had more positive perspectives toward this statement.

6. Discussion and conclusion

This study was conducted at Dhaka University to reveal the academic use of smartphones by students. The results showed that the students who used smartphones also used the internet on these devices. Out of 316 students who responded to this survey, all of them used the internet to search for relevant information. It was found that nearly two-third of the respondents utilized their smartphones as a means to access academic information. The findings also showed that the students used smartphones to obtain news, utilize social networking sites, access sports-related information and so on. The findings indicate that about one-third of the respondents do not use smartphones to support their learning needs, although nearly 90 per cent of the total respondents were interested in downloading apps for academic use. Future research should investigate why some students at Dhaka University are not utilizing their smartphones for learning purposes. One possible reason that might affect students' use of smartphones is the speed of the internet connection and the lack of Wi-Fi access points at the university campus (Ahmed, 2013, 2014). It is evident from this study that many students utilized their smartphones as Wi-Fi hotspots to share an internet connection with computers or other mobile devices. Therefore, Dhaka University needs to encourage and promote the use of smartphones by providing the necessary infrastructure support, such as setting up Wi-Fi networks across campus to make the internet more accessible to the students.

Contrary to earlier studies, the current findings indicated that the students used smartphones more for academic supports than for accessing social media sites or entertainment. It is evident from current research, as well as from previous studies, that internet-ready small handheld devices are increasingly being used by university students for their learning needs (Nortcliffe and Middleton, 2013; Woodcock *et al.*, 2012). Despite significant educational use, this study found that less than a quarter of academic smartphone users among the students at Dhaka University utilized them for locating library references. As Bomhold (2013) mentioned, students used general search engine apps like Google, Safari and Yahoo! on smartphones to look for information. She noted that students are not likely to be interested in using other apps for searching for information until they offer something that the search engines cannot. This means

Student opinion	χ^2	df	Asymp. sig.
Makes it easier to search for information relevant to my studies	8.157	3	0.043*
Improves my study skills	8.926	3	0.030*
Makes it easier to access and complete my studies	4.561	3	0.207
Makes it easier to participate in class-related discussions	9.621	3	0.022*
Increases my knowledge in my field of study	17.561	3	0.001*
Increases my motivation toward completing my studies	8.494	3	0.037*
Overall academic quality	5.992	3	0.112

Note: *Significant at $p < 0.05$

Table XVII. Participating university students ($n = 316$), K-W test results for opinion on advantages of using smartphones for academic work by place of origin

library references need to be more intuitive and easier to use with enhanced features and functionalities. It is, therefore, important that publishers and library database providers continue to add innovative features and functionalities into their apps to make them more accessible and relevant to student needs.

The results of this survey indicated that nearly half of the students who used smartphones for academic activities utilized them for recording class notes. Recording class notes may take the form of taking copies of important presentation slides or notes, audio recording of class lectures, conversation with study groups or other speaking events. It was found that, combined together, nearly 80 per cent of academic users use smartphones for recording and preparing class notes. It seems that some students may covertly record class lectures, which faculty members may not be aware of. While recording of lectures could be beneficial to students' learning, it may also have serious implications with regard to appropriateness of some contents or subject matters discussed in the class. The results from other research indicated that recording class lectures could have potential detrimental effects on students' attendance in the class and their course performance (Maynor *et al.*, 2013). Therefore, Dhaka University needs to devise appropriate policies and guidelines for audio-recording class lectures and for storing and using such recordings.

Regardless of whether the students use their smartphones for academic work or not, the results from this study indicate that they had positive perceptions toward smartphones as tools for academic activities. Although there were some differences in terms of gender, age, place of origin and duration (months/years) of smartphone use, these differences are largely due to the fact that smartphones are a relatively new addition to the life of most students who participated in this study. This may make it difficult for them to ascertain the effects of this new technology on their educational achievement. Moreover, many students who participated in this study do not use smartphones in their academic pursuits. Overall, the students, on average and across the board, had positive attitudes toward smartphones as a tool for academic support. As smartphones become more accessible and affordable to students in developing countries, such as Bangladesh, perceptions and uses of these new devices in an academic context will likely change. In this situation, the present study could be only a prelude to much greater and diverse roles of smartphones in academic activities which are yet to come.

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Appendix. Questionnaire: The use of smartphone for academic purposes

Section A: Academic and demographic information

1. Faculty/Institute:

2. Status: ☐ Undergraduate ☐ Graduate

3. Gender: ☐ Male ☐ Female

4. Age group: ☐ 17-20 years ☐ 21-24 years ☐ 25-29 years

5. Where is your place of origin?

   ☐ Rural area ☐ Small town
   ☐ City ☐ Metropolitan city

Section B: Smartphone use

6. Which brand of smartphone do you use currently?
   ☐ Nokia ☐ Samsung
   ☐ Walton ☐ Apple
   ☐ Symphony ☐ Other, please specify

7. How long have you been using the smartphone?
   ☐ 1- 6 months ☐ 6 months to 1 year
   ☐ 1- 2 years ☐ 2-3 years
   ☐ More than 3 years

8. Do you use the Internet on your smartphone? ☐ Yes ☐ No

9. If yes, how do you access the Internet?
   ☐ Mobile network ☐ Wi-Fi ☐ Both

10. Do you share your smartphone's Internet connection with other devices such as a tablet or laptop? ☐ Yes ☐ No

11. How frequently do you access the Internet via your smartphone?
    ☐ A few times every day ☐ At least once a day
    ☐ A few times a week ☐ At least once a week
    ☐ At least once a month ☐ Other, please specify.

12. Which search engine do you prefer to use on your smartphone for information access?
    ☐ Google ☐ Opera
    ☐ Ask Jeeves ☐ Yahoo!
    ☐ Other, please specify.

13. What types of information on the Internet do you generally access through your smartphone? (You can select multiple options.)
    ☐ Academic ☐ Sports ☐ Music ☐ Entertainment
    ☐ Social networking sites ☐ News ☐ Other, please specify.

14. If you have used your smartphone for academic purposes, for what purposes do you use your smartphone? (You can select multiple options.)
    ☐ Reading full-text articles ☐ Recording class notes
    ☐ Preparing class routine ☐ Watching learning videos
    ☐ Library references ☐ Other, please specify.

15. Would you be interested in downloading apps for academic purposes?
    ☐ Yes ☐ No

(*continued*)

Section C: Your opinion on using smartphone for academic purposes

16. Regardless of whether you use your smartphone for academic purposes or not:
(a) do you think a smartphone could help:

Facilitate learning?	☐ Yes	☐ No
Save time and increase productivity?	☐ Yes	☐ No
Skill development and training?	☐ Yes	☐ No
Finding up-to-date information?	☐ Yes	☐ No

(b) overall, how important do you feel a smartphone could help you in achieving your academic goal?

☐ Extremely important	☐ Important
☐ Moderately important	☐ Not very important
☐ Not at all important	☐ Do not know

17. Please rate your opinion on the following statements on the advantages of using smartphones (1=lowest to 7=highest):

Makes it easier to search for information relevant to my studies	1	2	3	4	5	6	7
Improves my study skills	1	2	3	4	5	6	7
Makes it easier to access and complete my studies	1	2	3	4	5	6	7
Makes it easier to participate in class-related discussions	1	2	3	4	5	6	7
Increases my knowledge in my field of study	1	2	3	4	5	6	7
Increases my motivation towards completing my studies	1	2	3	4	5	6	7
Overall academic quality	1	2	3	4	5	6	7

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