

Use of 3G Services by Research Scholars in Central Universities in India: A Study

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Abstract

The main purpose of the study is to find out awareness and use of 3G services among the research scholars of the University of Delhi and University of Hyderabad. The study demonstrates that research scholars do use 3G services for purposes other than communication and entertainment. Majority of respondents fall under the age group of 26–30 years and use mobile phones for both communication and leisure. Airtel is the popular 3G service provider and its users specifically engage in browsing academic/research networking sites. Availability of music and audio are the main features for purchasing new mobile phones. Broadband and ticket booking are the frequently used services and creating video games on the Internet cloud are the occasionally used 3G service. Majority of the respondents stated that 3G provides functional value by enabling them to accomplish tasks easily, more quickly, effectively, and conveniently. Interestingly, mobile phones are not used for promotion of one's own research and exchange of ideas, which is the principal issue addressed by this study. None of the respondents reported an increase in accessing subscribed library e-journals and databases. Poor network coverage is perhaps the biggest barrier that interrupts the enjoyment of using 3G services. The findings of the study will not only guide research scholars in effective use of 3G services, but also help them in awareness of new mobile phone specifications including 3G service features. In addition, it will help the university authorities and vendors in facilitating effective access of licensed library e-resources and providing a valuable reference for service providers to develop 3G mobile value-added services.

Keywords: Communication technologies, 3G services, Mobile technologies, Universities, Delhi, Hyderabad.

1. Introduction

Mobile phones are becoming a part of the daily culture of almost every student and teacher. They introduce new types of communication styles that remove spatial and temporal complexities (Alexander 2004). A vital instrument with various benefits (ease of contact, privacy, etc.), carried by individuals, in order to stay informed and connected with the world, it is not surprising that some students get attached to their mobile phones (Balakrishnan and Raj 2012). The technology in use today will soon be past tense and subsequently updated and replaced with more advanced and refined technology. Along with the development of mobile technology, the technology embedded in small communication devices is getting more and more sophisticated (Ong, Poong and Ng 2008). Starting with 1G, the country has seen the evolution of 2G, and then Third Generation (3G), and there are talks of 4G soon arriving in India. The 3G rollout in India first commenced in 2008 by MTNL under the name '3G Jadoo' (Kishor 2011). The 3G deployment in India is aggressively being carried out by many private mobile operators.

Today's environment is characterized by the increasingly mobile workforce and flatter organizations. Individuals are equipped with notebook computers and spend more of their time working in teams that cross functional, organizational, and geographic boundaries. Much of these students' productive learning occurs on meetings and away from their desks (Rekha and Magesh 2013). Effective use of mobile technologies requires that students exhibit digital literacy skills such as being able to access, manage, and evaluate digital resources (Drenoyianni, Stergioulas, and Dagiene 2008). 3G mobile communication technology has increased bandwidth, reinforced speed and efficiency of data transmission, as well as increased the speed and convenience of data retrieval (Kuo and Yen 2009) and is suitably designed for multimedia communication.

One of its key visions is to provide seamless global roaming, enabling users to move across borders, while using the same number and handset. The compatibility of 3G services with their existing lifestyle, the relative advantage of 3G services and the enjoyment of using 3G services are found to be significantly associated with the intention of the university students to use 3G services (Ong, Poong and Ng 2008).

1.1 Understanding of 3rd generation of mobile network

The third generation mobile technology based on wide band wireless network fulfilling the International Mobile Telecommunications-2000 (IMT-2000) specifications by the International Telecommunication Union which has quest for data at higher speeds to open the gates for a truly 'mobile broadband' experience, which will be further realized by the fourth generation (4G) (Shukla *et al.* 2013). The speed of data transmission on a 3G network ranges between 384 kbps to 2 mbps. This means a 3G network actually allows for more data transmission and therefore, the network enables voice and video calling, file transmission, internet surfing, online TV, view high definition videos, play games, and much more. 3G is the best option for users who need to always stay connected to Internet (Prince, 2014) and the services promise a future world of universal wireless phones, global roaming, and wireless Internet access.

The present study will focus on the use of mobile phones mainly for 3G services by research scholars of the Universities of Delhi and Hyderabad for information communication and to accomplish their academic and research information tasks easier.

1.2 University of Delhi

The University of Delhi, popularly known as DU or Delhi University, is a premier university of India. It was established in 1922 (<http://www.du.ac.in>) and is well-known for its high standards in teaching and research. The University of

Delhi has been ranked number one by the India Today-Nielsen Survey and features among the top 100 universities in the world according to a recent global survey 2014. At present, there are 16 faculties, 86 academic departments, 83 colleges, recognized institutes, and two campuses spread all over the capital city of India, with around 175,000 students in the collegiate mode, and another 300,000 approximately in distance learning, and about 3,500 are pursuing MPhil, and PhD. The colleges at the University of Delhi provide the highest density of higher education learners in the territory of Delhi and perhaps anywhere else in the country.

The University of Delhi has, in keeping with its traditions and growth, moved from strength to strength. The University has maintained its number one rank in the list of Indian universities. This is a tribute to the inherent strengths in the systems and institutions of the University of Delhi. The University has delivered high quality research in niche areas, strengthened its facilities and professional networks to be an academic leader while serving the country in an effective and dedicated manner (Research Profile, University of Delhi 2013).

1.3 University of Hyderabad

The University of Hyderabad (UoH), popularly known as Hyderabad Central University or HCU, was established in 1974 (<http://www.uohyd.ac.in>). It is one of the major institutions of higher education in India, is largely devoted to postgraduate studies, and is widely known for its excellence in research and for its distinguished faculty. The University offers close to 150 different programmes of study, ranging from doctoral studies to Masters level degrees, with 46 different departments and centres organized in 12 schools of study and over 5,000 students. The University is a public research university with high research activity in every department and awards about 300 doctorates every year; nearly 695 are pursuing MPhil or MTech courses and 1,551 the PhD. The University

has been recognized by the University Grants Commission as a 'University with Potential for Excellence'. The University ranks amongst the top 10 universities in the country. It has been re-accredited with an A Grade (CGPA of 3.72/4.00) by NAAC in 2014 which is the third cycle. *India Today* placed UoH at the fifth position in its rankings of universities for 2014. The UoH also features in the QS rankings of top 200 Asian universities (Wiki University of Hyderabad 2014).

2. Review of Related Studies

Technology is booming in every area, particularly in the education system, many trends and competitions are emerging for the career and betterment of students (Rai and Rai 2010). Due to rapid advances in the Internet and wireless technologies, a ubiquitous computing world is becoming a reality in the form of mobile computing (Hong and Tam 2006). 3G aims to provide fast Internet access with quality of service guarantees, especially to multimedia applications (Tostes *et al.* 2010) and higher wireless bandwidth, audio and video services (Mahfuz and Latif 2013). It is a revolutionary step towards the world of wireless broadband. It opens doors to possibilities that can be translated into as many tools, services, and applications as the region needs (Pervaiz 2009).

Students have adequate knowledge and good awareness to use such technology in their education environment (Alzaza and Abdul 2011). Students of University of Malaysia confirm that students use the Global System of Mobile to contact their lecturers, course mates, parents, siblings, and sending short message services (Ajagbe 2011). M-learning is considered as the next generation of e-learning using mobile technologies. Students' awareness of such technology is one of the most focuses for success adoption. The adoption patterns for mobile services are a key challenge for research in mobile technology applications (Carlsson *et al.* 2006) and technical components enabling

mobile data service usage are spreading (Smura, Kivi, and Toyli 2009). Future uptake of mobile data services may be formulated not only through a number of common factors (mobile entertainment services), but also by situation-specific ones (for example, mobile information services) (Bouwman *et al.* 2010).

Most recently, Boruff and Storie (2014) investigated the extent to which students, residents, and faculty members in Canadian medical faculties use mobile devices. The results of this study will inform how health libraries can effectively support mobile technology and collections. Bomhold (2013) surveyed the undergraduate students' usage of smart phone applications. This research provides evidence on the actual use of mobile devices by students for academic library applications and reports that they use apps to find academic information. Dresselhaus and Shrode (2012) reported that 54 per cent of undergraduate students at Utah State University use mobile devices for academic purposes. The use of mobile phones by the youth has stirred a plethora of research in different fields (Arho, Sami and Timo 2014). The literature states that mobile phone addiction is common among university students (Balakrishnan and Raj 2012; Chung 2011; Dresler-Hawke and Mansvelt 2008; Walsh, White, and Young 2008, 2010). As Hoppe (2009), Ferry (2008), and Cui and Wang (2008) state that students can use browsers to check emails, read materials such as e-books, and watch lectures from anywhere and at any time. 'In fact, there has to date seldom any communication equipment used as popular as a mobile phone. It comes as no surprise that people are eager to find ways to apply these portable and personal handhelds for education purpose' (Liu, Han, and Li 2010). Although consumers can easily adopt high-speed data transmission through the 3G system, enjoy video/audio entertainment, and convenience of retrieve live information, the usage rate of current 3G services is still low. Ramburn and Jean-Paul (2011), in a study of

South African 3G use corroborates, apart from SMS, that users were indeed generally slow to adopt any of the 3G data services (Zhou *et al.* 2013).

Furthermore, Rekha and Magesh (2013) conducted a survey on use of 3G services among the students of Pondicherry University, India. The findings revealed that majority of the respondents use mobile phones mainly for communication. Further, a majority of the respondents stated that usage of 3G services makes them feel accepted by others and gives functional value by enabling them to accomplish tasks easier, more quickly, effectively, and conveniently. The survey instrument taken in this study is similar to that of Rekha and Magesh (2013) with major modifications.

3. Research Objectives and Methodology

- To find out the use of mobile phones by research scholars of the University of Delhi and University of Hyderabad;
- To know the purposes of using 3G services in academic and research work;
- To ascertain the use of mobile phones for Library e-resources;
- To identify the favourite 3G services among the research scholars; and
- To find out the experience, opinion, and problems of using 3G services.

The scope of the study restricted to use of 3G services, including academic and research work by 200 research scholars (MPhil, PhD, and both males and females) at the Universities of Delhi and Hyderabad. The selection of the sample (from all subjects) from the universities under study was done on the basis of use of 3G services and taken from the Faculty of Sciences, Faculty of Social Sciences, Faculty of Arts, and Faculty of Humanities.

To solicit information about the use of 3G services, a structured questionnaire was designed

and included different type of questions, such as: dichotomous (yes/no), multiple choice, rating, and opinion questions, to elicit their experience of research scholars in: (i) purpose of using mobile phones, (ii) specific purpose of using mobile phones, (iii) mobile phone services, (iv) mobile phone connection, (v) experience in using mobile phone, (vi) use of 3G services, (vii) resources used to know about 3G services, (viii) features to be considered while purchasing new 3G mobile phones, (ix) favourite 3G services, (x) amount spent for 3G services, (xi) opinion about 3G services, and (xii) problems encountered by the users, etc.

In the first phase, a pilot study was conducted in the University of Delhi from January 15–20, 2014 on the use of 3G services, among research scholars, in order to improve the latter's quality and efficiency of the designed questionnaire. The findings of the pilot study were compared with the latest literature. All the suggestions were critically analysed and modifications were made in the final questionnaires, wherever found necessary. The finalized structured questionnaires were distributed to research scholars, personally, in the months of March and April 2014 and were collected back during April 2014 itself.

4. Analysis of Results

The study was conducted on a sample of 200 of which, 172 filled-in questionnaires were personally

collected by the investigator, eliciting a response rate of 86 per cent. All the questionnaires were selected for the analysis of data. The responses received to 15 questions from the research scholars are illustrated in the form of tables and figures and the implications of the findings are also discussed in relation to past research.

4.1 Gender and age-wise distribution

A brief section of the questionnaire deals with the personal profile of the respondents. The various facets of qualitative part of the questionnaire consists of questions based on demographic features. The representation of research scholars based on the gender (Table 1) and age-wise distribution (Table 2) was sought. Table 1 shows that female representatives are greater than male representatives. The data clearly indicates that the dominance of female research scholars 87 (50.59 per cent), as compared to male research scholars 85 (49.41 per cent). A Chi-statistic (p-value) was carried out between two groups is 0.684 (University of Delhi) and 0.788 (University of Hyderabad), of which the University of Hyderabad is 0.104 greater than the University of Delhi. Table 2 depicts the age-wise distribution of respondents in the universities under study. According to the analysis majority (75.59 per cent) of the respondents, under the age group of 26–30 years emerged as the most aware of all. Also, this is the age group which considers cost to be the most important factor, placing it above all the

Table 1: Gender-wise distribution of respondents

Faculty	Gender				Total
	Male		Female		
	UoD*	UoH*	UoD	UoH	
Sciences	13	11	14	12	50
Social Sciences	14	12	13	09	48
Arts	09	11	12	14	46
Humanities	10	05	06	07	28
Total	46 (26.74%)	39 (22.67%)	45 (26.17%)	42(24.42%)	172(100%)

Note: *UoD-University of Delhi; UoH-University of Hyderabad

Source: All tables and figures have been provided by the author

Table 2: Age-wise distribution of respondents (n=172)

Age group	Number	Percentage
Below 25	04	02.32
26–30	130	75.59
31–35	34	19.77
Over 35 years	04	02.32
Total	172	100

remaining factors when it comes to selecting the provider or even selecting 3G over the current 2G they are using, followed by the age group of 31–35 years (19.77 per cent). Surprisingly, equal number respondents are falling below 25 years and over 35 years, i.e., 2.32 per cent each.

4.2 Purpose of using mobile phones

This is the most important and basic aspect related to the appraisal of the usefulness of 3G services, because, research scholars are able to send e-mail, play games, communicate, download, transfer data, and purchase entertainment packages on the move. Everything that is possible via the Internet will be possible via a mobile phone and that offers tremendous opportunities for business, commerce, education, and entertainment. Here, an attempt has been made to find out the general purpose of the use of mobile phones by respondents (Figure 1).

As indicated in Figure 1, it is interesting to note that majority (36.05 per cent) of the respondents

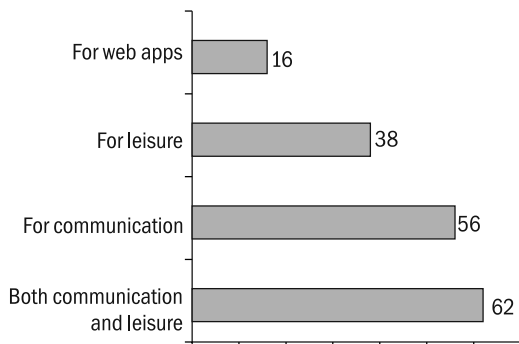


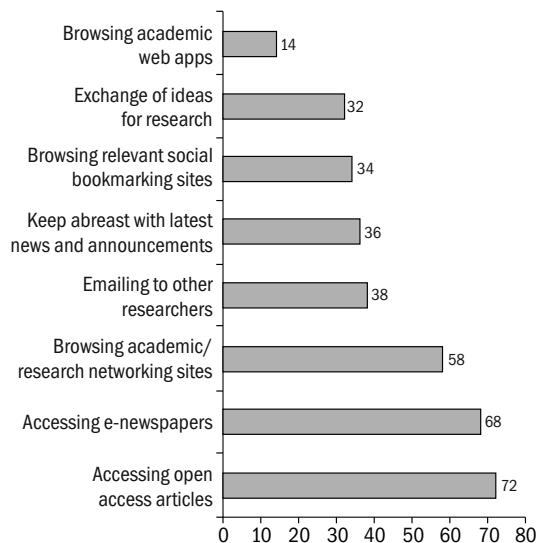
Figure 1: Purpose of using mobile phones (n=172)

are using mobile phones for both communication and leisure, followed by 32.56 per cent using primarily for communication, and 22.09 per cent using for leisure. Only 9.30 per cent of the respondents are using it for Web apps. Similar results can be seen in the study of Viticci (2012) which indicates that mobile devices are mostly used for entertainment and communication.

4.3 Specific purposes of using mobile phones

Mobile phones have a wide variety of uses and purposes like, email, accessing websites, apps, and, to a great extent and communicating with other research scholars. A question was asked of the research scholars in order to gauge the specific purposes of using mobile phones for academic and research work, such as by exchange of ideas among research scholars, or accessing e-newspapers, open access articles, browsing academic/research networking sites, social bookmarking sites, academic Web apps, etc. (Figure 2).

It is evident from Figure 2 that accessing open access articles are the most specific use of mobile phones (41.86 per cent). These findings



Note: Multiple answers are permitted (n=172).

Figure 2: Specific purposes of using mobile phones

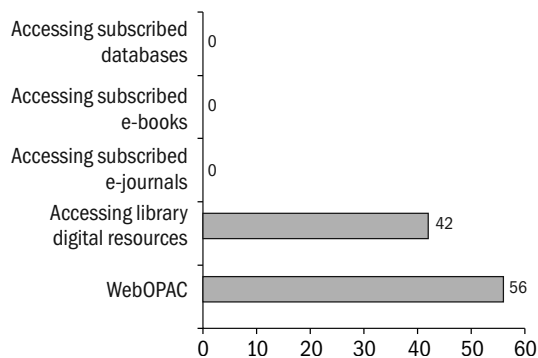
are consistent with those of Boruff and Storie (2014). They reported that students are using free resources on a regular basis and using such a wide variety of resources raises questions about where should libraries be investing time and money with regard to mobile resources.

The other specific uses are e-newspapers (39.53 per cent); browsing academic/research networking sites (33.72 per cent), emailing other researchers (22.09 per cent); keeping abreast with latest news and announcements (20.93 per cent); and social bookmarking sites (19.76 per cent). Mobile phones are least used for browsing academic web apps (8.13 per cent). As per the mobile technology researcher, Bomhold (2013), apps they use are familiar and allow mobile access to popular academic websites they can find on their desktop computers.

Interestingly, no mobile phone was used by more than 42 per cent of the respondents for any one specific purpose. A selectively lower percentage of research scholars in terms of exchange of ideas (18.60 per cent), which is the principal issue addressed by this study, did not substantially use mobile phones used for promotion of their own research.

4.4 Use of mobile phones for library e-resources

Electronic resources are invaluable research tools, which complement print-based resources in any traditional library. The libraries of both the universities under study are comprise a huge collection of scholarly e-journals and databases and provide free access and 2 mbps bandwidth for browsing these e-resources in campus-wide network with the help of University Grants Commission—Infonet Digital Library Consortium. Mobile devices will have an ever-growing presence in medical education and the practice of medicine (Boruff and Storie 2014). In connection with this supplemental question, respondents were asked whether they are utilizing the full potential of 3G services for accessing library e-resources.



Note: Multiple answers were permitted.

Figure 3: Use of mobile phones for library e-resources (n=172)

Their responses are depicted in Figure 3, thus revealing that 32.55 per cent respondents use mobile phones for searching WebOPAC, followed by library digital resources (24.41 per cent). Surprisingly, none of the respondents were accessing subscribed e-journals, e-books, and databases. The study finds that the libraries of the universities under study are not providing Wi-Fi access to access e-resources, while in some faculty libraries, the Wi-Fi hardware is installed but not activated. It is interesting to note that expensive library licensed e-resources are not mobile-optimized and remain the most significant barrier to access. Moreover, using mobile devices to access the library subscribed e-resources will help the research scholars in completing their research work on time, because, e-resources are invaluable research tools for research scholars (Madhusudhan 2008). Libraries will be responsible for maintaining and delivering the subscribed e-resources including UGC Infonet Digital Library Consortium via a variety of computing technologies for optimum utilization, considering the fact that the libraries, of the universities under study, and vendors need to think of new solutions appropriate to the mobile environment and authenticate through proxy servers or VPNs (Virtual Private Networks) to access, since majority of the

respondents in this study are reading open access articles on their mobile devices.

4.5 Mobile phone services

Both 2G and 3G are merely milestones in mobile technology and represent two different phases. While 2G ruled the world of mobile phones for a decade, it is the turn of 3G now that is being widely used in the country. But there is news that 4G is soon arriving in India which indicates how fast technology is moving. There are many differences between 2G and 3G, and most of them pertain to the features available to the users of mobile phones. In this context, it is obvious to know the mobile phone services used by the respondents (Figure 4).

It is clear from Figure 4 that 59.30 per cent of the respondents are using 3G services, followed by 2G (30.23 per cent), 4.65 per cent of the respondents are using Code Division Multiple Access (CDMA) services, and remaining 5.82 per cent of the respondents mentioned that they are not aware of the services they use.

4.6 Mobile phone connection

There is an increase in mobile phone providers with companies designing and developing their very own platforms and operating systems. 3G offers a wide range of applications. These applications are mainly made possible due to the enhanced data rates as a result of the 2 mbps bandwidth availability. As demonstrated in Figure 5, a good number of the respondents

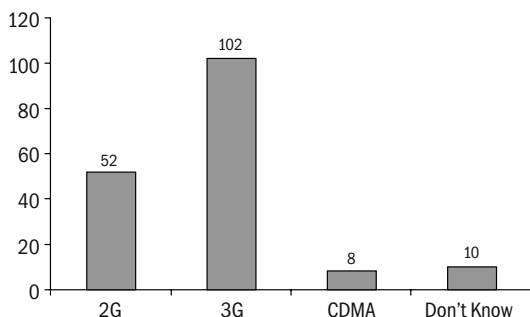
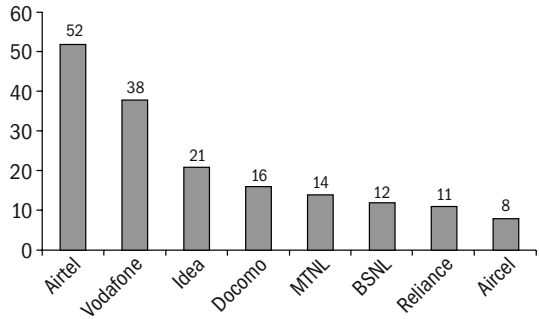


Figure 4: Mobile phone services (n=172)



Note: Multiple answers were permitted.

Figure 5: Mobile phone connection (n=172)

(30.23 per cent) are using Airtel connection, followed by Vodafone (22.09 per cent), Idea (12.21 per cent), Docomo (9.30 per cent), MTNL (8.14 per cent), BSNL (6.98 per cent), Reliance (6.40 per cent), and Aircel (4.65 per cent). These findings are supported by the latest study conducted by Rekha and Magesh (2013).

4.7 Experience in using mobile phones

The mobile user experience encompasses the user's perceptions and feelings before, during, and after their interaction with mobile presence and its purpose, using a mobile device that could lie anywhere on the continuum from low-end feature phone to a high-definition tablet. Respondents' experience in using mobile phones are analysed and represented in Figure 6. It is found that 44.19 per cent of the respondents have more than 4 years' experience, 38.95 per cent of them have an experience of 2–4 years in using the mobile phones, and 14.53 per cent

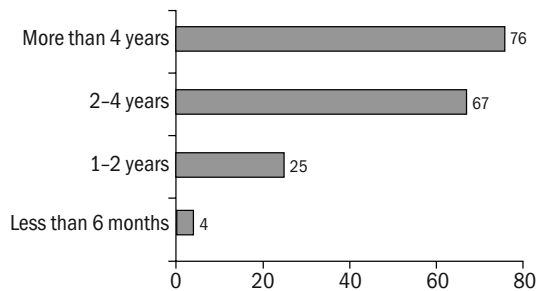


Figure 6: Experience in using mobile phones (n=172)

have an experience of 1–2 years. Nearly, 2.33 per cent indicated that they have been using mobile phones for less than six months.

4.8 Use of 3G services

3G mobile phones is hypothesized to comprise three consumer perceptions: new technology, new service, and new handset. The responses received from the respondents are presented in Figure 7. Analysis shows that majority of the respondents are using 3G services (59.30 per cent) while 30.23 per cent of them are not using 3G services, and the remaining 10.47 per cent of them are not aware of 3G services.

4.9 Resources used to know about 3G services

As part of the survey, research scholars were asked to mention the resources used to know about 3G services and the result is depicted in Figure 8. Analysis shows that a large majority of the respondents (24.42 per cent) came to know about 3G services through websites, followed by TV (19.77 per cent), newspapers (18.02 per cent), social networking sites (15.70 per cent), radio (8.14 per cent), and magazines (6.40 per cent), and roadside hoardings (4.65 per cent). A few of them (2.90 per cent) mentioned word-of-mouth (friends) and library as the sources to learn about 3G services.

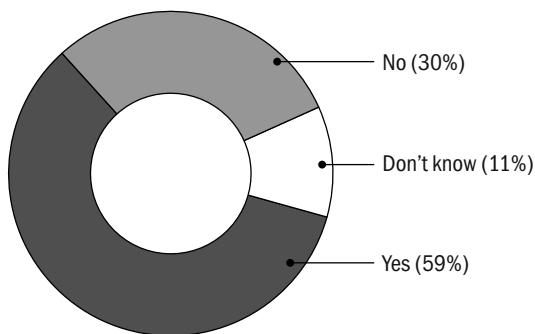


Figure 7: Use of 3G services (n=172)

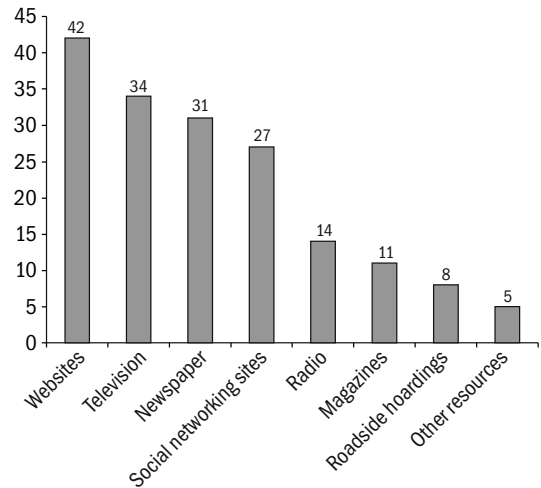


Figure 8: Resources which helped to know about 3G services (n=172)

4.10 Features to be considered while purchasing new 3G mobile phones

Mobile phones possess many features, but this questionnaire provided the 16 topmost ones as multiple choices. Table 3 shows the respondents’ opinion about the features to be considered while purchasing new 3G mobile phones. The analysis shows that all respondents want to purchase a new 3G mobile phone based on the music and audio available (59.88 per cent). The findings of this study do not correlate with the findings of North, Johnston, and Ophoff (2014). In their study, they found that usability and price emerged as the top purchasing factors. The other top 10 features considered by respondents while purchasing mobile phones are, Internet (51.74 per cent), communications (41.86 per cent), latest offers (39.53 per cent), photography (38.37 per cent), software platform and operating system (32.56 per cent), design (28.49 per cent), hardware (26.74 per cent), service available (25.58 per cent), and user interface (18.02 per cent). Interestingly, the environment (packaging, materials, recycling, and user guide) is the least considered feature among sixteen features (3.49 per cent).

Table 3: Features to be considered while purchasing new 3G mobile phones

Features	Number	Percentage
Music and audio (music apps, audio features, and radio features)	103	59.88
Internet	89	51.74
Communication (social apps, email features, photo sharing, and video sharing)	72	41.86
Latest offers	68	39.53
Photography (main camera sensor, main camera focus type, camera resolution, camera digital zoom, camera image formats, flash type, and main camera-other features)	66	38.37
Software platform and operating system	56	32.56
Design (display size, display resolution, display technology and display features)	49	28.49
Hardware (battery model, battery life, RAM, memory size, bluetooth, NFC, GSM network, and WCDMA network)	46	26.74
Services available	44	25.58
User interface	31	18.02
Navigation/ease of use (location and navigation apps, and location technologies)	30	17.44
Available colours	28	16.28
Video (camera video frame resolution, camera video frame rate, camera video zoom)	27	15.70
Handset size and weight	24	13.95
Business features (business apps, email clients, and email protocols)	08	4.65
Environment (packaging, materials, recycling, and user guide)	06	03.49

Note: Multiple answers were permitted.

4.11 Favourite 3G services

Technology saves money too and gives a quick return on investments. 3G is defined to facilitate growth, increased bandwidth, and support more diverse applications. These applications are mainly made possible due to the enhanced data rates as a result of the 2–8 mbps bandwidth availability. Some of the applications are: (i) Mobile TV—due to the high data transfer rate being offered due to 3G, TV can be viewed on mobile phones. For this, it is essential to tie up with a service provider through which the content can be accessed; (ii) Video Conferencing—one can conduct

video conferencing through mobile using the available network. All this is feasible due to the enhanced bandwidth of 2 mbps; (iii) Telemedicine—is an extended feature of video conferencing where a remote person can be given attention by a doctor located at a distant place; (iv) Location-based services—are some services through which we can access the dependence of the service provider for instance, weather updates, live road traffic view, vehicle tracking, etc.; (v) Video on Demand—users can view videos on demand from their service provider. In order to provide this service, the service provider should collaborate with the

content providers, etc. This is again possible due to the high buffering speed possible due to the 3G network (Singh *et al.* 2010). To accomplish the above, a three point rating question was asked to the respondents to rate the favourite 3G service rendered by their service providers according to the rating, from very frequently used to occasionally used and their responses are depicted in Table 4.

Table 4 illustrates that mobile broadband is a very frequently used service (60.46 per cent), followed by mobile gaming (50.58 per cent), and mobile TV (37.79 per cent). In frequently used 3G services, majority of the respondents are using ticket booking (56.98 per cent), video call (54.07 per cent), and location of information services (52.91 per cent). Among occasionally used 3G services, creating video games on Internet cloud (94.19 per cent), followed by chat (70.93 per cent), and paying utility bills (51.16 per cent). Interestingly, 43.02 per cent of the respondents prefer content download (picture, wallpaper, games, music, or video download).

4.12 Amount spent on 3G services

The amount spent on 3G services by the respondents vary from one to another and are

contingent on usage and purpose. It is important that users have access to affordable web-enabled mobile devices and can afford Internet connectivity and content. Figure 9 illustrates the average amount spent per month by the respondents for using 3G services.

Figure 9 clearly indicates that a good number (55.23 per cent) of respondents spent ₹601–800 per month while 18.61 per cent stated that they are spending ₹401–600 per month, followed by ₹801–1,000 (15.12 per cent), and over ₹1,000 (6.39 per cent). Around 4.65 per cent of them indicated that they spent below ₹400 per month. Further, most of the respondents were availing the discounted rates under corporate member plans in respective university localities.

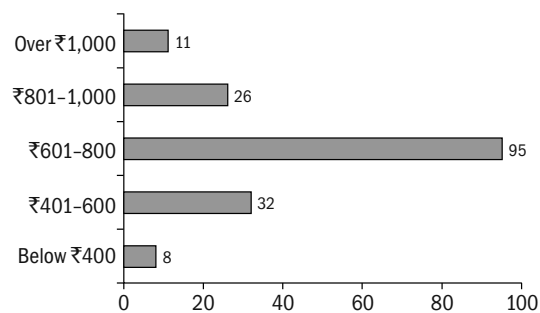


Figure 9: Amount spent on 3G services

Table 4: Favourite 3G services

Favourite 3G services	Very frequently used	Frequently used	Occasionally used
Video call	41 (23.84%)	93 (54.07%)	38 (22.09%)
Mobile TV	65 (37.79%)	85 (49.42%)	22 (12.79%)
Mobile Broadband	104 (60.46%)	51 (29.65 %)	17 (9.89 %)
Location of information services	63 (36.63%)	91 (52.91%)	18 (10.46%)
Ticket booking	58 (33.72%)	98 (56.98%)	16 (9.30%)
Mobile gaming	87 (50.58%)	81 (47.09%)	04 (2.33%)
Creating video games on Internet cloud	04 (2.32 %)	06 (3.49 %)	162 (94.19 %)
Paying utility bills	26 (15.12%)	58 (33.72 %)	88 (51.16 %)
Content download (picture, wallpaper, games, music, or video download)	74 (43.02 %)	79 (45.93%)	19 (11.05%)
Content upload (data, pictures and videos, etc.)	29 (16.86%)	68 (39.53%)	75 (43.61%)
Chat	12 (6.98 %)	38 (22.09%)	122 (70.93 %)

Note: Multiple answers were permitted.

4.13 Opinion about 3G services

In the Indian context, it is significant to mention the recent developments in mobile percolation. The growth of mobile phones in India has been phenomenal. Therefore, greater variety of services can add more value to its consumers (Agarwal *et al.* 2007). In this context, a question was posed to the respondents to rate the 3G services rendered by their service providers and responses received from them are presented in Table 5. Majority of the respondents stated that 3G gives functional value by enabling them to accomplish tasks easier, more quickly, effectively, and conveniently [(for example: m-banking applications (66.28 per cent)], followed by 3G can entertain and make them feel good, have fun, and enjoy (63.95 per cent), usage of 3G services makes them feel accepted by others (social approval) (57.56 per cent), use 3G because of curiosity to experiment with new ways of doing things or new technologies (53.49 per cent), customization of 3G is a way of expressing personality (51.74 per cent), 3G provides high speed data transfer for research (50 per cent), and by using 3G, they have some choice in the way tasks can be completed (48.25 per cent).

4.14 Problems encountered by the users

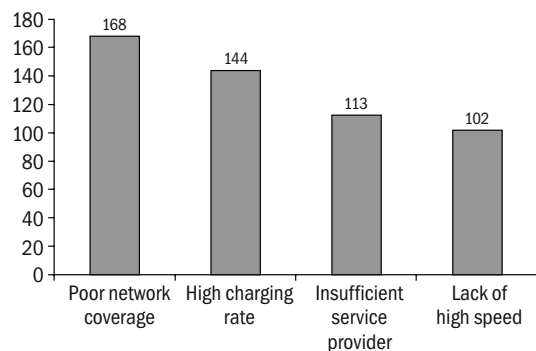
3G services are embedded in the vast majority of research scholars' lives. 3G service provides many attractive and additional features such as video calling, mobile TV, and of course, better services in comparison to the existing system, e.g. high speed internet, location information services, and more privileged to have access to more mobile web-based services. All these things appeal to users who subscribe to 3G. There are a number of obstacles in the way of using 3G services. The problems generally include high speed data transfer, poor network coverage, high charging rate, insufficient service providers, etc. To accomplish the above, a question was posed to the respondents to state as to the problems

or limitations they experienced while using 3G services in their localities (Figure 10).

Figure 10 reveals that users of 3G voted mobile broadband as their most frequently used service. Poor network coverage was the biggest barrier that interrupts the enjoyment of using 3G services at great extent with 97.67 per cent. Literature suggests that pricing of 3G services is one of the biggest challenges faced by mobile companies in India but this study confirms the same as high charging rate (83.72 per cent). The other problems are insufficient service providers (65.69 per cent) and lack of high speed hampering their use of 3G services (59.30 per cent). Similar problems, in varying degrees, have been pointed out by other researchers (Mahfuz and Latif 2013; Zhenyu *et al.* 2011; Indrawati, Murugesan and Raman 2010; Ong, Poong and Ng 2008, and Pagani 2004).

5. Conclusion

Mobile phones are known to be very popular among university students, increasing their social inclusion and connectedness (Balakrishnan and Raj 2012). The results of this study demonstrate that majority of the respondents fall in the age group of 26–30 years and those using mobile phones for both communication and leisure have more than 4 years' experience in using mobile phones, but are not substantially used



Note: Multiple answers were permitted.

Figure 10: Problems encountered by the users

for promotion of one's own research. Airtel is one of the most popular 3G service providers. Almost all respondents want to purchase a new 3G mobile phone based on the music and audio quality available, followed by Internet and communications. Regarding 3G services, broadband is a frequently used service, followed by ticket booking while creating video games on the Internet cloud is occasionally used. Majority of the respondents were using mobile phones for searching open access information resources and none of the respondents were accessing subscribed e-journals and databases. A good number of respondents spent ₹601–800 per month for 3G services. Majority of the respondents stated that 3G imparts functional value by enabling them to accomplish tasks easier, more quickly, effectively, and conveniently for their research work, but poor network coverage was the biggest barrier that interrupted the enjoyment of using 3G services to a great extent.

It is recommended that to encourage more research, scholars should use library-licensed resources on their mobile devices. Furthermore, Web 2.0 awareness amongst research scholars should be raised as these tools are believed to be efficient in exchange of ideas in research work. Moreover, universities recognize the need to adapt to these changing environments and their associated demands and expectations in order to fulfill the information needs of students and researchers and help them succeed in their academic endeavours (Tess 2013; Wentzel *et al.* 2005).

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The research study also holds some limitations regarding the sample size and 3G services are not widely used by the research scholars in the universities under study. In the survey, the respondents are asked to indicate their opinion regarding 3G services and mobile features, about which they may not be well informed. Hence, the research demonstrates anticipations rather than real experiences. Subsequent to deployment of the new technology, views about usefulness, easiness or enjoyment of 3G services may change. Therefore, this study should be counted purely as research scholars' experience about use of 3G services.

The findings from this study may be used as a foundation for other researchers who intend to examine how mobile phones and 3G services are effectively used for finding academic information. The study therefore, opens up a pathway for further research in finding reasons why research scholars are not using mobile phones to access licensed library e-resources and help the university authorities and vendors in facilitating effective access of the same. On the other hand, these findings may help 3G service providers in framing effective plans and strategies for 3G value-added services for university students.

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