

The mobile future of university libraries and an analysis of the Turkish case

Purpose – Smartphones will very soon become the standard means by which the Internet is accessed, and the rates of connection from mobile devices will supercede those which are computer-based. The hypothesis of this study is that the university libraries of the future will experience greater access from mobile networks, and that this tendency will also occur in Turkey.

Design/methodology/approach – In the study, both domestic and foreign literature surveys were undertaken to determine which mobile technology library services are offered in university libraries. 30 random central libraries of both private and state universities were selected from across the 7 regions of Turkey. To gather data, a 26-question electronic survey was generated and e-mailed to the library managers. The questions were based on findings regarding the mobile technology services provided by university libraries around the world.

Findings – By examining the survey results, it was determined that Turkish university libraries utilise a comparable level of mobile technology, and demonstrate a similar level of care with regard to the services they offer. There are mobile sites (separate sites or mobile sites as applications), mobile library catalogues, SMS services, chatrooms, consultations via IM tools, mobile device lending services, and augmented reality and QR code applications.

Research limitations/implications. In Turkey, the structures of university libraries operate under variable conditions due a lack of established standards. This causes negative results for the delivery of library services. For this reason, university library standards should be set as soon as reasonable practicable, considering the social/economic and cultural structure of the country.

Practical implications – Due to the transformative effect technology and the Internet have had on services, “information and communication technologies infrastructure” has been added as a sixth element to the five traditional library items: building, budget, personnel, collection, and users. Globalisation through the web has brought about the individualisation of services, and the slogan “content is king” has been changed to “the customer experience is king”. Fundamental library services are being adapted to allow mobile technology access, and this approach best reflects the new slogan. Therefore, the university library of the future may well be one which is entirely based on mobile technology.

Originality/value – The hypothesis of this study is that a mobile device-accessible university library will be the model of the future, and to research any evidence of this tendency in Turkey. This study is also meaningful because there have not been any studies of Turkish university libraries in terms of the services they offer to users of mobile devices. This paper is the first time that a comprehensive study has been made of current mobile technology-based services, and is also the first time that the applications of Turkish university libraries have been compared the newest that are available in other countries.

Keywords:

Information and Communication Technology (ICT), mobile research, academic libraries, mobile library services, Turkey, library items, survey

Article Type: Research paper

INTRODUCTION

The use of ICT in library services has allowed the standardisation of services and processes, and has also facilitated a moving away from personal activities.

According to Helft and Vance, the most important current technologies are those that are wearable and easily portable, rather than those that are desktop-based (Hu and Meier 2010; Tonta 1999). The most common current examples of this are smartphones, tablets, e-book readers and PDAs. According to Morgan Stanley, Smartphones will very soon become the standard means by which the Internet is accessed, and the rates of connection from mobile devices will supercede those which are computer-based (Becker, Bonadie-Joseph and Cain 2013; Hu and Meier 2010; Wong 2012).

ICT technologies have also changed academic publishing. Today's "hybrid" university library collections are more likely to be based on electronic resources rather than printed ones (Afzali 2008; Anunobi and Ezeani 2011; Das 2007; Thomas 2011). Since most information has been transferred to electronic media, information services in university libraries have greatly changed. Network-based communication and high-quality mobile Internet services are becoming more common and have removed the handicaps of time and place, making it possible for people to always reach information and thereby increasing the usage of library services.

The hypothesis of this study is that the university libraries of the future will experience greater access from mobile networks, and that this tendency will also occur in Turkey. The first section defines how the hybrid university libraries of today provide information technology services to users of mobile devices. In light of this information, the university library services for mobile technology that are currently available in Turkey are examined in the second section. By making comparisons with services from around the world, this section also discusses which services are fully provided, and attempts to discover the reasons why others are not.

The author is also a reference librarian in a university library and regularly interacts with users who access the library services from their mobile devices. The hypothesis of this study is that a university library that is accessible by mobile technology will be the model of the future, and its purpose is to search for any evidence that university libraries in Turkey are prepared to meet this challenge.

In addition, this study is also meaningful because there have not been any studies of Turkish university libraries in terms of their relationship with mobile technology. This paper is the first time that a comprehensive study has been made of current mobile technology-based services, and is also the first time that the mobile technology applications of Turkish university libraries have been compared the newest available in other countries.

METHODOLOGY

A comprehensive literature review to determine the services that have been prepared for mobile devices in university libraries was carried out prior to the study. The literature research, and the services identified therein, allowed the production of a web-based 26 item questionnaire which was then given to the participating university library administrators. The selection of administrators was intended to allow a comparison of Turkish university libraries with their international counterparts, as the service philosophies of the administrators is reflected in the attitudes of their institutions. The purpose of the questionnaire was to gather information regarding the current provision and implementation of services, as well as any related infrastructures, in Turkish university libraries and also included library items relating to user numbers, ICT and library educational services, as well as the direct effects of the institutions' total numbers of available computer equipment and personnel, and the capacity of their wireless infrastructures.

Since there are state and private universities in Turkey, it was necessary to make an attempt to collect data through a balanced representation of both, and to use at least one state and one private university from each of the 7 geographic regions of Turkey; all of the samples were otherwise selected at random.

According to the YÖK (Higher Education Council) 2016 data, there are 193 universities in Turkey. Of these, 109 are state and 76 are private universities¹. There are distinctive differences between state and private university libraries in terms of their buildings, collections, personnel, etc., all of which directly affect the services they provide. Of the 30 samples, 11 are private and 19 are state university libraries. 29 of the 30 contacted libraries participated in the study, with 26 successfully completing the questionnaire. **The current distribution of state and private universities is not balanced across all of the regions of Turkey. Selecting examples of both types from regions where they are most common was necessary to achieve a meaningful sample size. For example, eastern Anatolia has 1 private and 5 state universities.**

The questionnaire was intended to determine the presence of the following: a separate mobile website or a mobile website application, mobile library catalogue, QR codes, Augmented Reality (AR) applications, SMS or short messaging, instant messages (IM), chatrooms reference services, and mobile device lending services. The questionnaire also had items regarding when the libraries started their mobile technology-compliant services, the proficiency of the offered services, the statistical monitoring of mobile library services, the usability criteria of the existing mobile websites, **the provision of customisation applications**, the quality of the staff responsible for their mobile library services, and any future plans they might have for mobile technology applications and services. Since the topic is closely related to technology, some university libraries revealed that they consulted their university's IT departments before being able to properly provide answers.

The questionnaire is given in the APPENDIX.

1. MOBILE LIBRARY SERVICES FOR UNIVERSITY LIBRARIES

1.1 Why Mobile Devices are Important for Libraries

ICT, or Information Communication Technology, is the accessing of information via telecommunication. Although it seems to bear a resemblance to IT, "It primarily focuses on communication technologies and contains internet, wireless networks, mobile phones and other communication means" (ICT 2010; Rouse 2005). Mobile technologies are at the forefront of developments in ICT. This is due to the fact that since their early history of merely facilitating basic communication, modern mobile devices now contain entire suites of multiple media applications (Scolari, Aguado and Feijóo 2012: 30). The most popular current devices are smartphones, notebook computers, computers, special phones, MP3 players, cameras, PDAs, ultra-mobile PCs, wearable computers, and e-book readers, and many, if not all of these are capable of allowing access to information without imposing any restrictions on time or place (Lippincott 2010). In fact, it is highly likely that mobile devices will become the means for many kinds of communication (Tonta 2009; Aharony 2013, DeMars 2012).

The use of ICT by university libraries started at the beginning of the 1990s, but the real conversion in library services has been in effect since the beginning of 2000s, when many academic publications shifted from printed to digital media, thereby allowing the users to access sources at any time. As Internet access becomes more common through price discounts as well as better connection quality and higher speeds, and since academic publications are now primarily published digitally, interest in digital library collections has increased. This is borne out by the annual e-book research by the *Library Journal*, which stated that from 2010 on, e-book collections in university libraries have increased by 93% (Blummer and Kenton 2012).

On the other hand, although communication and technology costs show a decline commensurate with the intensification of technology, the "continuum" of library collections and the expansion of the digital aspect have relevance for their financial resources. Libraries solve this problem by utilising web-based international collaborations, and even though they do not own the works or

¹ Military Schools and Vocational Schools were not included.

collections themselves, this trend could allow them to provide a global collection (Afzali 2003). As a result of this, today's hybrid-type university library uses the word "place" to mean not only the physical location of that library, but also its virtual location (ACRL 2011).

Mobile technology services have been widely offered by university libraries since the late 2000s, coinciding with the launch of the iPhone, iPad and other smart devices. This is a common feature, as widespread use of technology in the public realm has caused increasing individualisation which has extended to library services and education in general.

Today's hybrid libraries have mobile websites and regular Internet sites. These sites often offer mobile library catalogues, QR code applications to find or access printed or digital library contents, AR applications which display location/shelf numbers, instant messaging (IM), SMS (short message services) communication channels with reference librarians, downloaded academic publications which may be accessed from the mobile sites, payment facilities, online rooms, locker and publication reservations. These fundamental library services could be provided entirely through mobile technology, and would require only modest levels of investment.

Many of today's library users, especially those born in the age of modern mobile technology, have not acquired the virtue of patience. This means that they expect to be able to access the required information at the desired time. Today, smartphones and other mobile devices are a fundamental means of access to every kind of information (Nowlan 2013: 142; Seeholzer and Salem Jr 2011). Accessing a library or its services through mobile devices has become the most preferred method of library usage (Paterson and Low 2011). Investigations show that most users want the mobile sites of libraries to provide (or, the most frequently used services of such mobile sites are): mobile catalogues, library accounts, SMS reference services, the ability to search mobile databases, and downloadable content. Many university libraries primarily provide these services (Becker, Bonadie-Joseph and Cain 2013; Kim 2013a; Nowlan 2013; Salem 2011).

Today, many leading academic publishers are making moves to ensure that their content is compatible with mobile devices due to the frequent use of mobile devices. Some libraries use mobile technology applications, and many others use web technologies that are capable of detecting mobile devices and which can provide the appropriate content.

The university library model of the future will be one that supports access from mobile devices. Another important factor is that the number of digital libraries is increasing.

According to Choi, the mobile library means the ability to access information from everywhere and at any time. "Being in the place where users are and providing mobile services will be a necessity rather than an option" (Vila, Gálvez and Campos 2010: 322). According to recent research, the most important reason for this is that the expectations of mobile university library users have increased, especially for research (Bridges 2013; Bridges, Rempel and Griggs 2010; Jensen 2010; Kim 2013a).

The use of mobile technology has increased to 80% in both day-to-day and academic life. This is most apparent in the non-classical nature of users' searches, the information itself and the way it is used, the transition from the perception of a given location for library collections and users, and even the users' perception of place. For these reasons, university library model of the future could very well be one that is entirely based on mobile technology (m-library) (Becker, Bonadie-Joseph and Cain 2013; IDC 2014; Kantha 2013; Kim 2013b; Latimer 2011; Pamela 2011; Paterson and Low 2011).

1.2 Mobile Library Services

1.2.1 Mobile Site: There are two different applications for the design of mobile websites:

Responsive website: The aim of this technology renders the website content at an appropriate size for the screen of the mobile device. In short, there is a single site design for all devices. For users, the advantage is that the whole site is displayed on the screen.

Separate mobile website: A mobile website is a summarised version of the original Internet site. The fundamental properties of a mobile website are that it provides the required content, cleansed of the unnecessary images and text, and that it is both usable and concise. As previously stated, many university libraries established their mobile sites in the late 2000s.

The services offered on mobile library websites include: user account, library catalogue, mobile-adaptive databases, IM, SMS reference services, working times, personnel, links to the Twitter/Flickr/YouTube/Facebook pages of the library, room and locker reservations, and links to the libraries' main Internet sites (Tay 2014).

An examination of existing content and layout of mobile library sites reveals that when mobile web sites were first created, the aim was to provide simple basic information; for example, working hours, communication information, etc. Today's sites are more oriented for research with mobile catalogs, mobile-compatible books and journal databases, etc. The display of content has become paramount (Becker, Bonadie-Joseph and Cain 2013; Kim 2013a; Vila, Gálvez and Campos 2010).

Recently, a student survey conducted at Hunter College² included the following question: "If the library develops a tool for mobile devices, what features would you want to see?". The responses included; easy searching within databases, catalogue searching and access to e-books. Similarly, when the college's mobile website usage statistics are examined, the most used services are the working hours information page, the databases, and the library catalogue (Becker, Bonadie-Joseph and Cain 2013).

The list of libraries that have a separate mobile website can be accessed via the "M-Libraries" wiki. (Farkas 2014). In addition to separate mobile websites, mobile applications can also be designed to achieve the same purpose. The use of mobile applications in library services is broadly covered below.

As an Application Mobile Library Website

The sizes of mobile library website applications are variable and are especially designed for small-screen devices to avoid issues of improper display or a lengthy rendering process. Therefore, the mobile device properties that library users own should be considered when designing a mobile web (Kantha 2013). Whatever the type, the common features that a mobile website must have are that it is clear, concise, usable, fast, useful (easy access to required sources and services) and contains links to the main Internet site (Houghton 2012; Kim 2013a; Kim 2013b; Pendell and Bowman 2012).

Therefore, a mobile application can be considered to be of much more use than a separate mobile website.

² Hunter College is one of the most populous colleges in New York



Fig. 1. Examples of mobile university library websites: icon style and list style views (Tay 2014).

1.2.2 Mobile OPAC (library catalogue):

The ability to use mobile technology to search through library catalogues has become an important issue. The results of much research carried out in different countries reveal that users most want to see the mobile library catalogue in the mobile website, and this is borne out by an examination of the statistics on this issue (Cummings, Merrill and Borrelli 2010; Dresselhaus and Shrode 2012; Kim 2013a). A recent survey performed by the California Digital Library (CDL) revealed that 60% of the students prefer to search the mobile library catalogue. This and related studies all conclude that students are interested in using mobile technologies for research, and therefore give importance to the provision and level of mobile library services (Paterson and Low 2011).

Occasionally, a university library may offer a mobile library catalogue only as a mobile application. In general, mobile applications are preferred by users because they are considered to be more useful.

1.2.3 Mobile Applications

When a new mobile technology service or element is designed, whether it is an application or not, decisions about its use must involve the users' desires and the device types being used (Walsh 2012). In addition, the application must never be a prototype; it must always be fully-developed before it is released. For libraries, such an application may be a QR code reader, an augmented reality overlay, a library catalogue or a mobile site. If there are no restrictions on personnel developing applications and support for obtaining the required licenses and meeting any costs, many useful services could be designed. The top 100 applications for libraries are listed by Nyland (2014).

QR Codes

QR codes are two-dimensional, patterned graphics that offer text and Internet website content when read by mobile devices (Whitchurch 2011: 14). They are termed "QR" because they allow a "quick resolution" of the content (Ashford 2010: 526). Their production and use are relatively straightforward.

In university libraries, QR codes can be used for many things. In fact, it would not be wrong to state that their potential usage fields are only limited by the designer's imagination; for example, accessing the electronic version of a textbook that is present as a printed version; accessing an electronic version of an article published in a journal; showing the shelf codes of books of a definite topic; announcing new items; making room and locker reservations or accessing unused computers;

giving an electronic library tour and orientation; providing database guides; training videos; introducing library materials; accessing communication, etc. (Ashford 2010; Kantha 2013).

Figure 2 shows the QR code sample from a university library which redirects users to the mobile library website.



Fig. 2. QR code generated to redirect users to the mobile website. Adapted from <http://www.georgefox.edu/offices/murdock/MobileSite.html>

Mobile Applications Based On Augmented Reality

According to Azuma 1997; K. Lee 2012. “Augmented reality (AR) refers to the technology that presents virtual information dynamically to be overlaid onto a real world environment in real time” (Kang, 2015, p.219). AR technologies include headsets, handheld devices, projectors, and computer screens, but today, AR applications are frequently designed for use by mobile devices.

According to Green, Lea and McNair 2014; Meredith 2015; and Mulch 2014, the library itself can be a source of anxiety, especially for university students. Very few students are able to successfully complete a research project on their own, and librarians have attempted to use a variety of methods to overcome this problem. In recent years, AR applications have allowed customised access to all library places and collections, rather than only those that are in use at the time (Kang, 2015). In this way, the library becomes an area of attraction for students. Whatever the type, a library system that can enable users to find shelf codes and shelves themselves will be of benefit. In addition, not every user may come to the library with a specific selection in mind. For instance, a freshman student might want to explore the library and its collections rather than access a definite item (Huang, Shu., Yeh, Zeng (2016). With an AR bookshelf application to provide location-based information to mobile devices, users can learn which shelf contains which item or receive comprehensive information about the collection. For example, it can give information about the electronic versions of an item, the printed versions of which are in the possession of the library, or the lending information for a given book that allows users to see which materials are the most popular. In summary, fundamental information about a collection can easily be given to users in digital form.

AR applications are important for librarians as well. For instance, ShelvAR, developed in 2013, helps librarians to organise shelves more quickly. Labels on the books also show whether they are on the correct shelf and reveals any which may be missing.

The library tour is especially designed for freshmen, and it allows users to easily see which shelf contains which collection so that they may become familiar with the organisation of the library

more quickly. Similarly, universities with multiple campuses and libraries also benefit from these applications by being able to show the exact location and content of each library. In most cases, the applications regarding the collections are mainly place-finders.

The 21st century academic library is turning into a prototype-testing and experimental laboratory, and AR applications are one of the newest examples of this transition (Hahn, 2012). However, it is important that these systems are thoroughly tested in a scientific manner for usefulness and reliability, before they are made available.

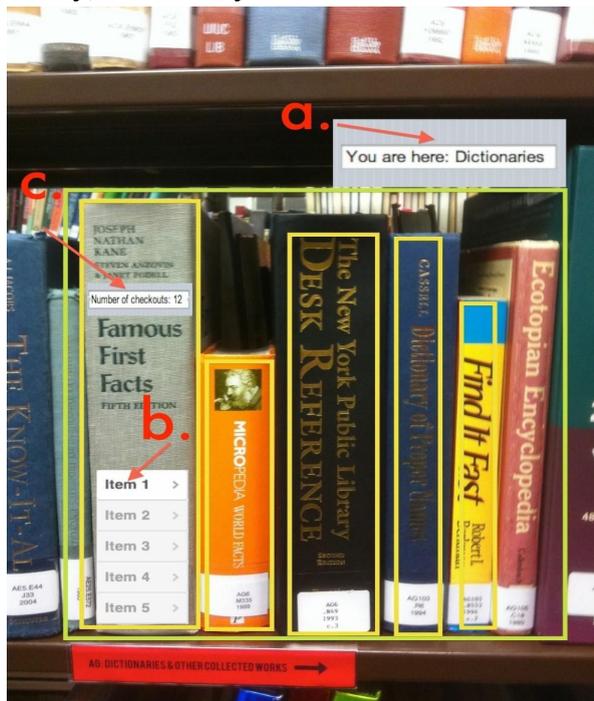


Fig. 3. An example bookshelf AR (<http://acrl.ala.org/techconnect/?p=1750>).



Fig. 4. AR Indoor Navigation is used to “provide an innovative, reader-centred information service for the physical library.”Tien-Chi Huang Yu Shu Ting-Chieh Yeh Pei-Ya Zeng , 2016, s. 112)

1.2.4 Mobile Device Lending Services

Due to the widespread use of mobile technologies, university libraries have begun mobile device lending services. These devices are most likely to be laptops, chargers, digital cameras, iPads, iPods, headphones, and projectors. In the current age of mobile learning, libraries should provide their users with creative/innovative services. However, mobile device lending services entail an additional financial burden for the library, regardless of whether they are self-service or staffed. If the mobile devices are lost or stolen, the library must be able to cover the extra costs and IT personnel requirements (Wang and Arlain, 2014).

1.2.5 SMS, IM Reference Services

Since university library collections have begun to shift toward greater use of electronic media, there has been a corresponding increase in the provision of electronic reference services. Today, thanks to mobile technology, such reference services can be offered free of charge through the use of IM, SMS or eMail, thereby eliminating the need for users to visit the library in person (Li, 2013).

2. MOBILE LIBRARY SERVICES IN TURKISH UNIVERSITY LIBRARIES

The rate of mobile Internet data traffic is constantly increasing. This situation is also true for Turkey; in 2010-2013, annual fixed broadband subscriber numbers increased by 10% whereas mobile broadband subscriber numbers increased by 40% (TR Ministry of Development, Strategy of Information Society for the years 2014-2018 and Course of Action, 2014 draft). This trend is also supported by other statistical evidence. According to 2015 data from TUIK, 96.8% of houses have mobile phones or smartphones, while land-line usage was only 29.6%. Within the same period, 25.2% of households had desktop computers, 43.2% had portable computers and 20.9% had televisions capable of connecting to the Internet. In addition, 74.4% of people using the Internet in the first three months of 2015 employed mobile phones or smartphones in order to connect wirelessly outside the home and workplace, 28.9% of them employed portable computers (laptop, netbook, tablet, etc.) <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=18660> access date 29.03.2016. In Turkey, as in other countries, tablet computers are popular with higher education students and another survey revealed that tablet users are also likely to be smartphone users (87%). In addition, reading books on tablet computers has reached a rate of 55% (Özkan 2012). Taken together, these figures show a large and increasing trend away from traditional media and towards the electronic and mobile realms.

In terms of the ownership of Internet addresses, Turkey is 15th among the countries with most users, and according to comScore, it has the third highest result in Europe (Euromonitor 2012; Euromonitor International 2014). Additionally, when mobile infrastructure investments are examined, Turkey is first with 64.5% for the 2008-2011 period. Taken together, these statistics show that in Turkey, information and communication technology and users' adaptation to it is growing very quickly (OECD 2013a).

Today's university library model is a hybrid one, and libraries often contain more electronic collections than printed ones (Oppenheim, C. and Smithson, D. 1999). For this reason, ICT has emerged as a necessity. In a university library with a combination of the latest technology and web-based services, it is not enough to merely offer services that reflect classical library items such as the building, budget, personnel, collections and users. An ICT infrastructure must be added to the existing library items as a sixth element.

In this study of the Turkish case, 19 state and 11 private (total: 30 universities) university central libraries were examined. The participants in the questionnaire were universities of several sizes. Of Turkey's 76 private universities, 34 of them are in the Marmara region, and 32 of them are in Istanbul. In addition, the South-eastern Anatolia region does not have any private universities, and the Black Sea region only has one or two private universities. Therefore, universities from the Marmara, Central Anatolia, Aegean and Mediterranean regions were used to provide a sufficient sample size as the Black Sea, Eastern Anatolia, and South-eastern Anatolia regions have limited sampling opportunities. Both private and state universities were selected, this was done to provide a large enough sample size and create a representative sample. For future reference, 98 Turkish libraries were founded between 2006-2013, and have not yet been completed (Afzali, M. 2008). The current study is therefore an attempt to offer a realistic reflection of library provision in the country.

Below are the mobile library services which are already in effect or which are likely to be put into effect in the near future:

- Mobile website (application or separate mobile website, mobile-responsive web site).
- mobile library catalogue

- SMS, IM reference services
- QR code applications
- AR applications
- Mobile device lending service

When asked about the establishment of mobile library services in Turkey, 18 institutions responded that it accelerated after the launch of the iPad in 2010. This is comparable with results from other countries.

22 of the 26 institutions which answered the questionnaire reported that they are capable of providing basic library services for the users of mobile technology. These are as follows: working hours information, consulting the librarian, finding spare computers, making room reservations, accessing databases, managing user accounts, allowing catalogue searches, providing SMS reference services, delivering news and making announcements, delivering information through QR codes and AR applications and providing mobile device lending services.

According to the results of the questionnaire, the most provided service are mobile website applications. 16 of the 26 institutions stated that they have mobile websites.

QR code applications are reported as being another of the most popular services among the participating institutions. This is followed by mobile device lending and SMS messaging services.

Only one institution has AR applications, and this is also the least known service. Its popularity is low among the participating institutions. In fact, several of the participants did not have the necessary information and experience of AR technologies to give meaningful answers. Following completion of the questionnaire, some reportedly asked what “AR” referred to. Several institutions skipped this question. 8 institutions reported that they do not have any mobile technology services.

Table 1 shows the distribution of mobile services in university libraries.

Table 1. Mobile services provided by the example institutions.

| Service provided | No of libraries |
|---|------------------------|
| SMM reference services | 2 |
| QR code applications | 8 |
| IM (instant message) or Chatrooms | 6 |
| Mobile device lending | 6 |
| Mobile website | 9 |
| Mobile applications | 12 |
| Augmented Reality (AR) applications | 1 |
| Online library, paying fees | 1 |
| Reservations of working rooms and lockers | 3 |
| Not having mobile library services | 8 |

Table 2. Mostly used services in the mobile site.

| Used service | No |
|--------------------|----|
| Catalogue search | 15 |
| User profile | 7 |
| Databases | 5 |
| Working hours | 5 |
| Desktop version | 2 |
| Announcements | 4 |
| Social media links | 5 |

The questionnaire was also intended to reveal which service or services were most often visited through the institutions' mobile sites. 18 of the participants answered this question and stated that the most popular services were catalogue searches, user accounts, databases, working hours information, social media links, and announcements. The least used service was the link to switch to the desktop version. Table 2 shows services on the mobile sites of the participating institutions in order of importance.

21 institutions responded to the question about the usability of the mobile site and services. Almost 70% of these institutions replied that they did not apply a usability test, and only 30% of them had a mobile application. 21 of the 28 participating institutions did not regard their existing services to be adequate. 19 institutions stated that their Internet site remains more popular than its mobile counterpart.

The questionnaire also included an item regarding the existence of customisation for the institutions' mobile services. Customisation allows users to edit the existing site layout so that only the desired services are listed. 15 of the 20 institutions that responded to this question replied "No" and 5 others replied "Yes". This is a sign that more development may be required

Responsiveness is another valid issue for library websites. During this study, a Samsung brand Android (xxx) tablet computer was used to connect to all of the participating websites to check their responsiveness. With one exception, all of the participating institutions' library websites have responsive designs.

Today's common tendency is to deliver information regarding location, directions, activities, and announcements via mobile technology. The presence of a library on a university mobile website is important. 25 of the participation institutions responded to this question. 50% responded "Yes" and 32% responded "No". Half of the institutions are part of their university's mobile website. This should not be underestimated, and may prove to be positive in terms of the services provided. However, and as can be inferred from the information above, there is no homogeneous response to this topic .

The questionnaire also asked if mobile library services are regarded as a necessity by the library. 26 institutions responded to this question and only one sent a "No" response. The overwhelming "Yes" response to this question implies that Turkish university libraries consider mobile technology and mobile library users to be very important. The responses also imply that the future of university libraries will be based on mobile technology.

The participating institutions were also asked if they used mobile sites or applications. Since mobile devices' types, capacities, and resolutions are very different from each other, application-based mobile website design often only helps those with a specific model, but a separate mobile website allows a single site that can be used universally. Application-driven websites have better usability than separate mobile technology websites. In addition, designing an application is easier and has lower costs than separate site design. Mobile sites, whether applications or separate mobile websites, are the most comprehensive service that libraries can offer for mobile devices. Research regarding this topic has revealed that the most preferred mobile library services include items such as catalogue searches, library accounts, reference services, working hours information, directions, social media, FAQ and user guides.

When designing a mobile library service, the target user is important. The existing research shows that the highest proportion of users of mobile devices are aged between 18-29 (Yelton, A., 2012). The questionnaire for this study included user categories such as "student", "faculty member", and "all". 17 institutions answered this question and 80% of them picked "All" as their targeted user. This is different to the foreign institutions, which are more likely to select "Student". Only two of the participating institutions selected "Student" as their targeted user.

The definition of maintenance staff responsible for mobile site/services was also asked in the questionnaire. The options were; "Library IT Department", "University IT Department", "Librarian", and "External Contractor". 24 institutions answered this question and the responsible persons were mostly stated as being the university or library IT departments. In 9 institutions, the librarians and university IT department were responsible; in 7 institutions, the library IT department carried out maintenance duties; and 4 institutions had content designed by made their universities' IT departments. Of the remaining 4 institutions, 2 had content designed by the librarian and library IT department, and 2 used external contractors. According to the questionnaire results, the most common collaboration is between the librarian and the university IT department, which seems to be a suitable approach. The second most common responsible body was the library IT department and the third was the university IT department. as shown in Figure 5.

When examining at the team responsible for the design of mobile library services, In Turkey, the most frequent collaboration is that between librarians and software engineers, and with this respect the quality of responsible team for these systems is parallel to the situation in the university libraries of other countries

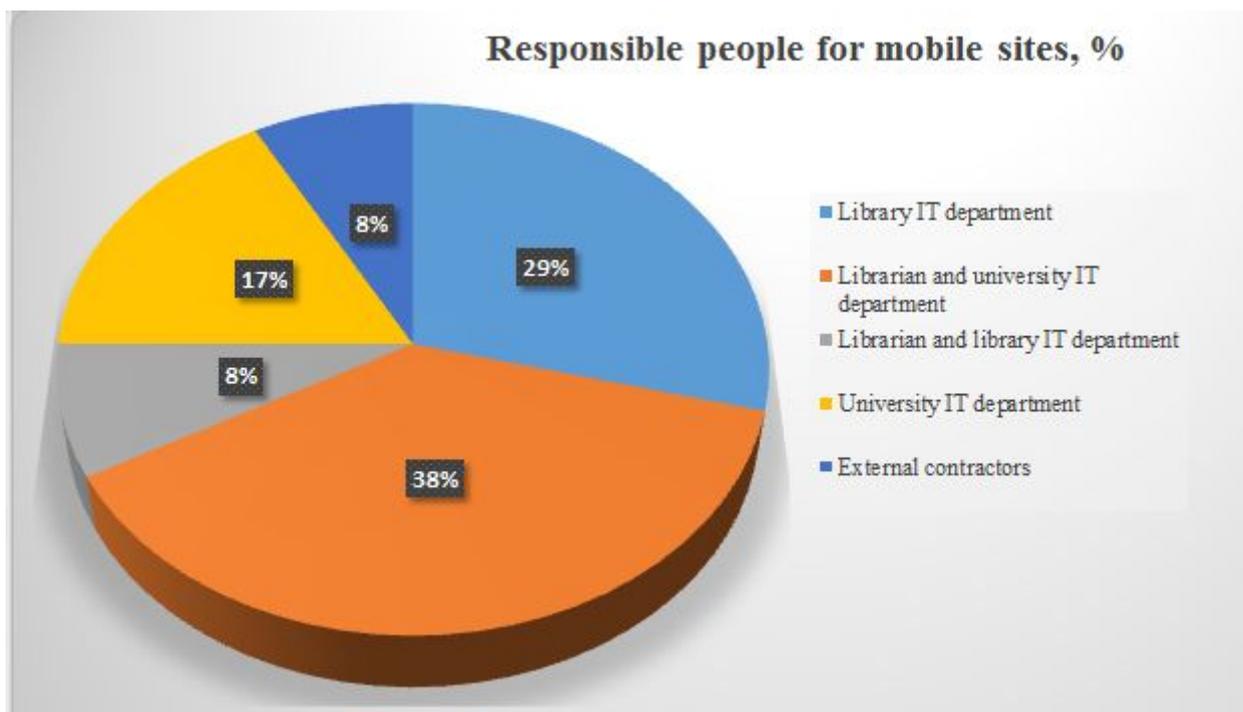


Fig. 5. Responsibility for mobile sites

Regarding the existence of mobile lending services, there were 18 responses to the question and 80% of the participating institutions stated that they used such services for tablet computers, notebook computers, and e-book readers. One institution does not lend mobile devices. 17 institutions use a lending service for tablet computers and notebook computers on an hourly or daily basis, with tablet computers being the most popular devices. 2 institutions also lend notebook computers. One institution lends e-book readers.

The presence of a wireless network inside the library has a positive impact on mobile access. 26 of the participating institutions responded to this question, almost all answering “Yes”. Only one institution indicated that they did not have a mobile network system. With these systems, users can freely access mobile services and academic content within the campus. The presence of a free, powerful, and uninterrupted internet network has a positive effect on library usage and the accessing of resources from mobile devices.

IM, a mobile-oriented service, and SMS capabilities were also items included in the questionnaire. Developing applications requires time, labor, and knowledge of software. Short messaging systems and reference systems (warning and reference) are applications which require considerable planning. 7 of the participating institutions responded that they have an IM service. Some IM services also have the capacity to allow SMS. When the necessary device configuration is completed, the SMS response from the user is forwarded to the IM service and then answered. In regard to SMS, 21 institutions responded to the question. 19 of them responded “No”. 90% of the sampling did not have SMS reference services. Since SMS is generally a paid service and does not fit within the budget structure of state university libraries, there is no instance of it being used by state libraries. 2 private universities reported that they provide this service. Moreover, maintaining the co-ordination between SMS and IM or chat requires a knowledge of software. The most probable reasons why services such as these remains uncommon may be that most libraries do not have staff-members with the required knowledge, which is something it has in common with the AR applications previously mentioned.

Finally, it is to be expected that a university with many users must also have a greater number of staff-members. 26 of the participating institutions responded to the questionnaire item regarding this issue. 14 of them gave the number of personnel divided into “librarian” and “non-librarian”, and 12

gave only the total number of staff. In recent years, university librarians conducted a study into the numbers of librarians working in Turkish universities and set an appropriate standard for the proportion of staff-members to users. The private universities returned totals that matched the given standard, but there were differences in the number of library staff-members at state universities (Çanak, T.A., Sönmez Çelik, İsmail Çetinkaya, Güneş, G., Gültekin Gürdal, İlkay Holt, Ebru Kaya, Ayhan Kaygusuz ve Çukadar, S, 2014.).

3. SUMMARY AND CONCLUSIONS

The participating institutions for this study were evaluated in terms of the services already offered to mobile device users around the world. There are mobile sites (separate sites or mobile sites as applications), mobile library catalogues, SMS services, chatrooms, consultations via IM tools, mobile device lending services, and Augmented Reality and QR code applications. In this study, the past of mobile services, future plans, and the presence and quality of the teams responsible for the design and maintenance of mobile technology compliant library services were examined.

8 of the participating institutions do not provide any mobile technology services. When the reasons for this are investigated, some are already in the preparation stage and will start their services in the very near future. Those institutions which do not have any current projects claimed that their mobile-adaptive websites are suitable for their current needs. Almost all of the institutions' websites are mobile-adaptive.

Turkish university libraries, just like their counterparts in other countries, began to take a greater interest in mobile services in the late 2000s, due to the release of the iPhone, iPad and other smart devices. In Turkey, the targeted user base for university library mobile technology services are students, academicians, and personnel, which could be summarised as "all users". In this respect, Turkish university libraries are one step ahead, since they aim to provide a service which encompasses all mobile device users within their purview.

Today, coding has come to be considered as a competence requirement for librarians. Therefore, librarian-IT collaborations have emerged to facilitate the development of more and better services.

When examining whether a separate mobile site or an application-type mobile website is more appropriate, researchers have reported that according to the studies made so-far, application-type mobile sites are more usable than separate mobile sites from the users' perspective. The reason for this is that users have several types of devices. In line with these findings, Turkish institutions mostly attempt to deliver mobile application library services, namely: mobile sites, QR codes and mobile library catalogues. With regard to mobile site usage statistics, the most frequently used services are catalogue searches, user accounts, and mobile technology-compatible databases. In this regard, Turkish institutions display similarities with other university libraries around the world – research-based mobile services are the most popular.

In those cases where mobile technology is catered for, it is a common tendency for university libraries to prioritise mobile services that facilitate research. According to the results of the questionnaire, mobile users tend to access the research results (catalogues and databases) from mobile devices, requiring that an adequate mobile library service is made available. At the moment, the Internet sites of the participating institutions remain more popular than the mobile sites; and this is similar result to the situation around the world. **However, mobile websites and relevant services have been under constant and rapid development, and to reflect this the presence of any customisation applications for the mobile services of the participating institutions was also investigated. The participating institutions that offer mobile technology applications reported an awareness of customisation applications, and some even provide services that allow it, However, the questionnaire results reveal that there has not yet been adequate development in this area.**

Almost all of the participating institutions of study report that regardless of their having an existing mobile service, they accept that mobile services will be a necessity in the future. For

example, IM a is frequently-used service which offers instant messaging and mobile lending, and in the provision of this service Turkish university libraries also bear similarities to their peers in other countries. **However, other applications, such as AR, are not yet widely known by Turkish librarians. This conclusion was further illustrated through telephone conversations between the author of this study and the participating institutions.**

As with many foreign institutions, several of the Turkish participating institutions are also testing a mobile device lending service. However, problems such as excessive wear, malfunctions, and maintenance, as well as the requirement for staff to be available to regularly update the devices might prevent the service from becoming common.

Overall, staff numbers could become an issue of greater importance in the future for many of the points raised by the incorporation of mobile technology into university library services. When the number of personnel is examined, the newly established and reorganising private universities report an insufficient number of personnel.

Today's mobile users do not limit the things they want to do with the devices they own, but rather attempt to use them in every possible area. The technology of tomorrow has been developing on the understanding of using a single device to do everything. As previously stated, globalisation through the web has brought the individualisation of services, and the slogan "content is king" has been changed to "the customer experience is king". Fundamental library services are being adapted into mobile technologies, and this approach best reflects the new slogan. Therefore, the university library of the future may well be mobile. **Another important finding supporting this view was given in three major international conferences on the mobile technology services provided by university libraries: "The Handheld Librarian", "M-Libraries" and "The Internet Librarian". These events highlighted the importance of personalised services in university library services and the importance of mobile devices in research activities.**

Recommendations:

The work done by librarians with regard to information literacy for mobile devices was not addressed in the study. In addition, investigating library and resource usage through mobile devices will add depth to any similar studies in the future.

According to the literature, it is clear that not enough space has been given to location-based personalised services in Turkey. Locally-based services, such as the free use of computers, directions to collections and mobile audio-visual library tours are good examples of personalised services.

The research process difficult to complete without support. For this reason, librarians should attempt to create a rich, mobile online learning content for mobile library researchers.

Technology is rapidly becoming involved in almost every area of our lives as a natural consequence of the research world. Castell said; technology is part of the human being, and as this theory evokes, it is becoming a part of human technology today because of the rapid developments in technology, according to the author.

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APPENDIX 1. QUESTIONNAIRE GIVEN TO THE EXECUTIVE MEMBERS OF THE PARTICIPATING ACADEMIC LIBRARIES

INTRODUCTION and PURPOSE: This electronic questionnaire is intended to establish the level of provision of mobile services in Turkish university libraries, and to determine which services are already available to mobile device users. Thank you for your participation.

1. Does your library have a wireless network?

- a. Yes
- b. No

2. How many personnel does your institution have? (please include librarians and non-librarians)

3. Is there remote (off-campus) access for databases and other e-sources for which your library has subscriptions?
 - a. Yes
 - b. No

4. Does your institution's Internet website have a responsive design for mobile device viewing?
 - a. Yes
 - b. No
 - c. Don't know

5. If your university has a mobile website, are the library services included?
 - a. Yes
 - b. No
 - c. Our university does not have a mobile website
 - d. Don't know

6. Do you regard mobile websites and mobile technology-related services for university libraries to be necessary?
 - a. Yes
 - b. No

7. Does your library have a mobile website?
 - a. Yes
 - b. No (please proceed to question 15)

8. When was the creation of your institution's mobile site and services first proposed?
 - a. After 2000
 - b. After 2007
 - c. After 2010
 - d. We do not have a mobile site or services

9. Is the mobile website of your institution a separate site or a mobile application?
 - a. Separate mobile website
 - b. Mobile application

10. What type of mobile website or mobile application is used by your institution?.
 - a. Original design of the institution
 - b. Application supplied by the library automation system

11. Who are the target users for your institution's mobile service or website?
 - a. Students
 - b. Faculty members
 - c. Administrative personnel
 - d. All of the above

12. Which unit is responsible for your institution's mobile service or website?

IT: Information Technology

- b. Library IT team
- c. Librarian and University IT
- d. Librarian and Library IT
- e. University IT department
- f. External contractor

13. Does your institution provide any of the following mobile services? (please indicate all appropriate)

- a. SMS Reference Service
- b. QR Code applications
- c. Reference consultations through instant messaging (IM) or chat
- d. Mobile device lending service
- e. Mobile website
- f. Augmented Reality (AR) applications
- h. Online library debt repayment
- i. Reservations for working rooms and lockers
- j. All of the above
- k. We do not provide any mobile technology services

14. Did you research the mobile websites and services of other institutions during your design phase?

- a. Yes
- b. No

15. Do you consider your institution's mobile website to be sufficient?

- a. Yes
- b. No

16. Did you perform a usability test for your institution's mobile website?

- a. Yes
- b. No

17. Which of the following items are the most popular according to your institution's mobile website usage statistics? (please indicate all appropriate)

- a. Catalogue search and/or collective search services
- b. User accounts
- c. Databases
- d. Working hours
- e. Desktop version
- f. Announcements
- g. Links to social media (Facebook, Twitter, etc.)

18. According to your institution's usage statistics, which website is more popular?

- a. Internet website
- b. Mobile website

19. Does your institution have customization applications for its mobile services?

(For example, allowing users to change the layout)

- a. Yes
- b. No

- 20.** What devices are included in your institution's device-lending service?
- E-book reader
 - Tablet, phablet (phablets are devices with telephone + tablet capabilities)
 - Laptop, notebook, etc.
 - PDA
- 21.** If your institution has a device lending service, what is the duration of the lending period?
- 1 - 3 hours
 - 1 day
 - 1 - 3 days
 - Other
 - Our institution does not have a device lending service (please proceed to question 24)
- 22.** How many mobile devices does your institution have available for its lending service?
(please include all tablets, laptops, USB chargers, netbooks, e-book readers, etc.)
- 23.** What are the main problems related with mobile device lending? (select all appropriate)
- Excessive wear, malfunctions and associated maintenance costs
 - Theft or loss
 - Time spent updating
 - All
- 24.** Does your institution have an SMS reference service?
- Yes
 - No
- 25.** If there is a mobile application for the library automation system, is it offered to users?
- Yes
 - No
- 26.** Is your institution subscribed to any collective research services that allow one-point searches of library sources (including catalogues and databases for both printed and electronic media)?
- Yes
 - No

Warm regards,
Gülçin Kubat