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Web 2.0 Use in Academic Libraries of Top Ranked Asian Universities

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Abstract

Purpose – This article aims to explore recent trends of how web 2.0 applications were used in 75 academic libraries in Asia through their library websites.

Design/methodology/approach – *The Times Higher Education Asia University Rankings 2016* was considered for this study and out of 200 top universities ranked, 75 universities were selected for data collection. Using a multi-method approach, this study evaluated key design elements, library service platforms and website content of each academic library website, examining their site features, web 2.0 types and applications. The criteria for selecting the websites were first the website was in English and second had web 2.0 applications integrated in the main website. For ranking of websites, a Library Web Service Index was developed, benchmarking from these groups—Resource discovery tools, Web 2.0 applications, E-resources, Mobile applications, Library guides, Digital reference services and Digital inclusion—as indicators.

Findings – We found that over two-thirds of Asian university libraries have deployed one or more web 2.0 applications, though their popularity and implementation vary greatly. Most widely used Web 2.0 applications are Facebook (61.3 percent), RSS (53.3 percent), Twitter (46.7 percent) and YouTube (37.3 percent). Instant Messaging (5.3 percent) and podcasting (4 percent) were least applied. With an average of 44 percent, the diffusion rate of web information is moderately high among the majority of the Asian university libraries.

Originality/value – Many studies explored web 2.0 applications from developed countries. However, this study attempts evaluating the use of web 2.0 applications through content, sites and features of academic libraries in Asia, from developing countries viewpoint.

Keywords: Web 2.0, Academic libraries, Library websites, Asia

Introduction

Academic libraries are evolving in their services to serve users and values they create for research impact. Since the revolution of social media, functionally, the web use has changed the perceptions, approaches and accessibility among library users, enhancing library services and leverage their potential to get the desirable benefits of access, dissemination and impact in a networked online environment critical for libraries in service provision and outreach (Qutab et al., 2014; Connaway, 2015; Shafawi and Hassan, 2018). Academic libraries facilitate information literacy, learning outcomes and scholarly communication—increasingly through social networking sites (SNSs) as reference utilities (Steiner, 2009; Fields, 2010). As a result, they have gained worldwide attention to communicate, share information and brought close relationship between libraries and users. As hubs of information, reference and research, academic library websites are embracing new web based technologies—where

discoverability of resources is critical through content, functionalities and site structures (Cohen and Still, 1999). The changing web necessitated this transition for libraries with substantive implications to embrace Library 2.0 principles and adoption of web 2.0 tools (Maness, 2006). Moving on from monolithic websites, academic libraries have embedded weblogs, folksonomies, Wikis, podcast and vodcast services to promote interactive, learning-centric tools in flexible and adaptable systems (Coombs, 2007). As online communities grew, the social media enhanced the perception, usefulness and values in online library services (Spiteri, 2009). Web 1.0 connected information, web 2.0 is to connect, represent meaning and bring all these closer together to build user experience by adding layers of meaning on top of the existing web as social, scholarly and semantic extensions (Bolinder, 2008; Balaji et al., 2018).

A new generation of web 2.0 applications calls for diversity of use and web based services are moving towards resilience, inclusion and adaptability. This is to provide accessible digital resources for all—to be intelligent, interconnected and personalized in a humanized service environment (Kelly et al., 2009; Zhang, 2013). Web 2.0 is about architecture of participation, where users contribute to reuse content and involves collective intelligence for libraries to infuse a sense of belonging, empowerment and self-service in a democratic way (Barsky and Purdon, 2006). Cloud computing and mobile devices took centrestage; searching technologies and user-generated content became norms (Belling et al., 2011).

Academic library websites became responsive in design, using different technology adoption models and integrated resource discovery tools for facilitating users. Socializing through social media among various communities of practice, academic libraries work with the mandate to ensure users effectively use ideas and information to communicate and produce creative information. They provide for the millennial users on information landscapes—support, reference services and instruction using social networking sites (Currie, 2010). Academic librarianship had deliberately discussed as the web evolved, designing library websites by structure, look, aesthetics, navigability and quality of information throughout the last two decades breaking down the unnecessary strong walls between our silos of library management systems and pathways for integration for searching and accessibility (Clausen, 1999). Figure 1 adapted from Oakleaf and Kyrillidou (2016) exhibits the common focus areas of the web 2.0 applications at academic libraries in a broader institutional context.

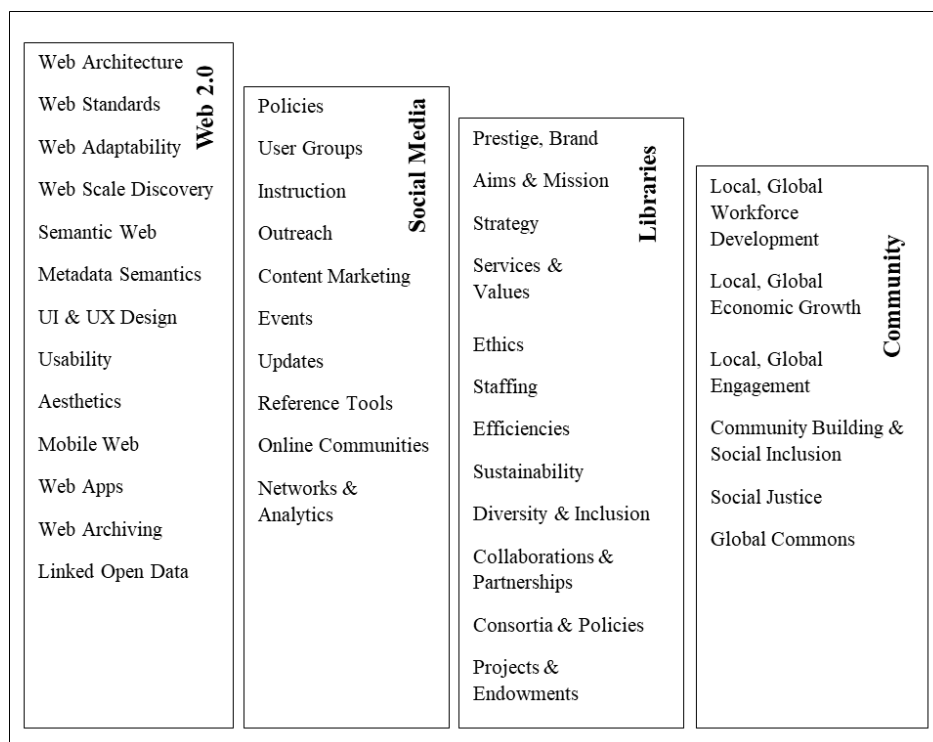


Figure 1. Common focus areas of web 2.0 applications in academic libraries.

Related Literature Review

As the web 2.0 became mainstream, academic libraries had widely examined the early adoption of web applications and various theories of Library 2.0, discussing the growth and implementation of web 2.0 services. Wang and Hubbard (2002) analyzed The University of Alabama Libraries' website based on principal characteristics and services provided, even as the web 1.0 applications evolved. They found that library website had changed the culture of the library, necessitating plans to host electronic resources and provide access remotely. Acknowledging the importance of web 2.0 for libraries, Maness (2006) pointed out the implications of Library 2.0 theory and underscored the essence of using tools like synchronous messaging and streaming media, blogs, Wikis, social networks, tagging, RSS feeds and mash-ups for adoption in libraries to intimate access to library collections and services. Linh (2008) found that among 47 Australasian university libraries, at least two-thirds of them had one or more web 2.0 applications, however the web applications were still low. In an another similar study, Han and Liu (2010) found that, out of 38 top Chinese academic library websites a two-thirds of the universities were using web 2.0 tools. The most used were catalog 2.0, RSS and IM, Blog, SNS, Wiki were less frequently used.

In order to facilitate quality learning outcomes, academic libraries enable and provide web based services for learners in a dynamic and interactive ecosystem using web 2.0 technologies (Konnur et al., 2010). Examining 57 top world universities, Harinarayana and Raju (2010) analyzed web 2.0 features of their academic library websites and found that RSS and blogging were highly used, while podcasting and vodcasting least popular. Si et al. (2011) in a survey of top 30 Chinese university libraries reported that two-thirds of Chinese university libraries have used one or more web 2.0 applications; one tenth used more than four web 2.0 applications, out of which RSS was found to be more used and Wiki the least. Mahmood and Richardson (2011) analyzed 100 academic web sites in USA and found that though blog, RSS, IMs, social networking sites, podcasting and vodcasting widely used,

Wikis, photo and presentation sharing, virtual worlds, customized webpage and vertical search engines were used less.

In a factor approach study, Alireza and Mansoureh (2014) discussed that, the effective factors playing key role to adopt web 2.0 applications in academic libraries are job conditions, changeability, skills, competitiveness and saving time. Baro et al. (2014) investigated the awareness and use of web 2.0 among librarians in the university libraries in Africa and found that Facebook, blog, Twitter, IMs and Wikis were the most used for reference services for announcing library news/events, photo and video sharing and training programmes to users. This study also revealed that the lack of facilities, skills and poor infrastructure as some of the barriers to use web 2.0 applications.

According to Al-Karousi et al. (2015) the Omani academic library websites were slowly embracing web 2.0 applications in their web services and found that two out of four academic libraries were using Facebook and one library was using Twitter and Instagram in order to provide services, getting feedback from users and for reference services. The most perceived benefits of using social media for library users are: keeping up to date with general information regarding library services, improved communication, personal connect with library, ask for help, making recommendations, easier access to information, awareness of new resources and promotion of events and competitions (Jones and Harvey, 2019). Yoon (2016) studied the perceived usefulness, interactivity and ease of use having significant effects on users' attitude and satisfaction for using mobile library applications. Torres-Pérez et al. (2016), in their study of world top 50 universities found that 44 universities have adopted mobile web for library websites. Verma and Devi (2016) studying the website contents and trends of 12 Indian Institute of Management libraries in India found that library information, collections, services are prominently displayed on the library websites and Facebook was used most (83 percent) and Wiki least (1 percent) among these academic libraries.

Al-Fadhli et al. (2016) in their study of technology adoption and use in Kuwait academic libraries found that the major challenges encountered for technology adoption are lack of national policy, decision-making styles, library/librarian status, staff shortage and techno-lust and also proposed interventions needed for implementation of web based services. Mierzecka et al. (2017) in a survey conducted among the Polish and Lithuanian academics found that "accessibility of online resources was revealed as the most important element of an academic library website, although information concerning the traditional or offline function of the library was also highly ranked." An evaluation of 110 academic library websites in the six Gulf Countries Council found that out of the 83 web features considered, no academic library website contained every web 2.0 application. Only three websites contained most of the features, at 84.3 percent, 78.3 percent and 76 percent respectively. Forty websites contained between 51 percent and 75 percent of the features, while 45 websites contained between 26 percent and 50 percent. The remaining 22 websites had 25 percent or less of the web features (Al-Qallaf and Ridha, 2018).

Scope of the Study

This study examines the website structure, library service platforms, design and content of academic libraries of Asia and is limited to the 75 select academic library websites, based on *The Times Higher Education Asia University Rankings 2016*. Though, the prevalence and use of web 2.0 applications in academic libraries in individual countries, offer a better understanding of the topic, however, using a systematic sampling method, this study

collected data from 14 countries, which better represents most of the countries in Asia. Language, cross cultures and the sample size are limitations of the study.

Research Questions

R1. What kind of web 2.0 applications are used and in what ways they have been applied at academic library websites in Asia?

R2. To what extent do academic libraries use resource discovery, electronic resources, mobile applications, library guides, digital reference and inclusion tools?

R3. What are the prominent website features, service platforms, key design elements, search options and functionalities (navigation, search interface design and content) found at the library websites?

Research Design

Research method

This study used a multi-method research design involving content analysis and website evaluation in a qualitative approach, reporting the summary of any form of content by counting various aspects, often used in the analysis of modern technologies such as Internet and websites. Site evaluation techniques employed is to get answers to key design elements, library service platforms used, interface, navigation and searching options. This approach was found to be fit for this research, as it not only shows evidence to the written words, but also helped to report data that actually exist (Linh, 2008; Boateng and Liu, 2014).

Research sample

In its first ever ranking of Asian universities, *The Times Higher Education 2016* ranked top universities in Asia, which were consistently improving with strategy, increased research funding, growing investments in higher education and are competing with the global top universities to gain performance, research impact and recognition. According to *The Times Higher Education Asia University Rankings 2016*, there were 200 universities ranked (see: <https://www.timeshighereducation.com/world-university-rankings/2016/regional-ranking>). Since the universities are linguistically diverse and geographically distributed in different countries in Asia, we decided to collect as much as data possible using the following methods:

- Populate a list of 200 The Times Higher Education Asia University Rankings 2016.
- Access all Asian library websites in this list to identify the presence of web 2.0 applications.
- Mark the list of academic libraries that used any type of web 2.0 applications.
- Based on the above, shortlist a sample of 75 universities as a sample for this study, representing Asia (See: Supplementary file for the data collected and the countries represented).

Data collection

The 75 Asian university libraries as a representation, selected for this study were visited during the period of April to June 2017 following the below criteria broadly to collect the evidence of web 2.0 applications found on the each library website (See Appendix I). The criteria used for sampling 75 university libraries was based on 'Library Web Service Index'

(See Appendix II) developed for this study to evaluate the library websites performance, adapted from these earlier studies (Al-Qallaf and Ridha 2018; Mainka et al., 2013; Balaji and Kumar, 2011). The indicators used for data collection were:

1. *Site and language*—library website, its content and site elements are in English or bilingual in the local language (e.g. Chinese). This included searching home pages and sub-pages; wherever the pages were not in English, they were translated using Chrome browser’s translation tool.
2. *Resource discovery tools*—consists of web-OPACs, library management systems and web scale discovery systems (WSDS); and search engines including site search options.
3. *Web 2.0 applications*—includes, blogs, RSS, social networking sites, photo and video tools.
4. *E-resources*—consists of e-books, e-journals, databases, e-learning/personalized system, electronic gateways, institutional repository/ETDs and local arts/heritage/museum digital collections.
5. *Mobile applications*—include mobile websites, library apps and others.
6. *Library guides*—designed as subject guides, FAQs/Q&A sites, content marketing and sitemaps/site index.
7. *Digital reference services*—are primarily e-mail, web form, instant messaging/chat options and Skype tools.
8. *Digital inclusion*—are alternative technologies and web accessibility tools for color-disabled (changing colors, fonts) and digital tools for physically challenged (Speech converters, special keyboards etc.).

Results and Discussion

Figure 2 shows that 62 (83 percent) universities are using web 2.0 tools on their websites, while 13 (17 percent) did not. It means that a two-third of them are using web 2.0 applications for various purposes, however, using traditional ways such as email, web forms and phones for providing services to the users for mainly reference services is still prevalent.

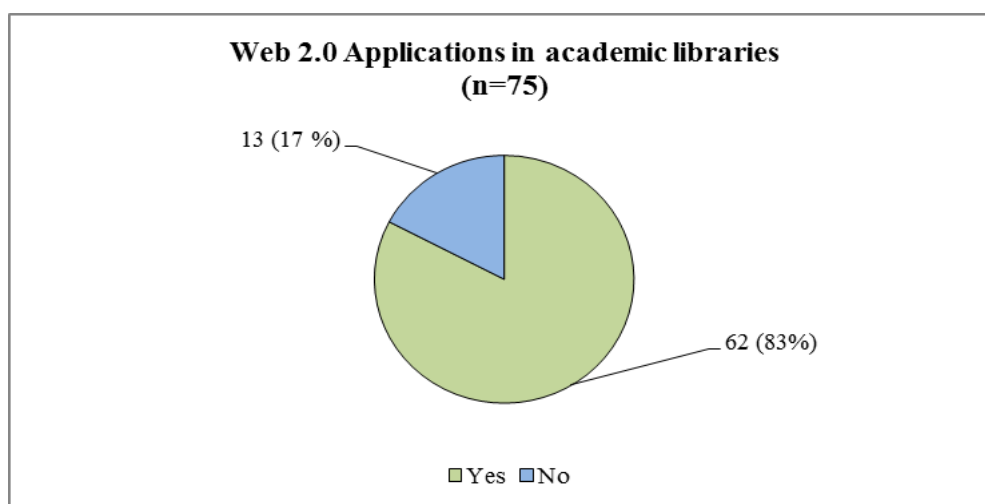


Figure 2. Academic libraries and web 2.0 applications

Resource discovery tools

As the analysis shows, resource discovery applications built in-house or vendor discovery platforms are being deployed for discoverability of library resources and content—regardless

of location, devices and open access resources. This mainly consists of web OPACs, WSDS and search engines. In this study an examination of resource discovery platforms, structure of web site homepages and use of WSDS was carried out and most commonly used terms of search boxes for searching were listed. It was found that 43 of the 75 libraries (57.3 percent) featured tabbed search interface on their library homepage, 22 libraries (29.3 percent) have multiple search boxes and 10 libraries (13.3 percent) have single search boxes (See Table 1). Academic libraries have used several terms in their tabbed, multiple search boxes and the most popular are: “E-Journals”, “Catalog”, “Books”, “Databases”, “Search”, “Thesis”, “Course” and “Guides”.

S. No.	Type of search	Number	Percentage
1	Tabbed	43	57.3
2	Multiple	22	29.3
3	Single	10	13.3
	Total	75	100

Table 1. Types of search boxes (*n*=75).

As exhibited in Table 2 “E-Journals” and “Catalog” were invariably the most used common terms for searching at library websites. Course search includes courses and instructors, which eight universities displayed as part of their search options. We found that 41 of the 75 libraries (54.7 percent) have search engines embedded on their websites.

S. No	Term	Use count
1	E-Journals [~]	49
2	Catalog [^]	44
3	Books [#]	31
4	Databases	29
5	Search [*]	29
6	Thesis [@]	17
7	Course	8
8	Guides	5

Table 2. Number of terms used in tabbed search boxes.

[~] "E-Journals" search includes: "E-Journals" (n=35), "E-Articles" (n=14).

[^] "Catalog" search includes: "OPAC" (n=8), "Catalog" (n=36).

[#] "Books" search includes: "Book & Media" (n=16), "E-books" (n=13), "Multimedia" (n=2).

^{*} "Search" search includes: "Quick Search" (n= 6), "One Search" (n = 8), "All Search" (n= 5), "Total Search" (n=2), "Power Search" (n=1), "Unique Search" (n=1), "Literature Search" (n=1), "Everything" (n=1), "Wonder Search" (n=1); "Site Search" (n=3), indicated search of the Library website, not an external website.

[@] "Thesis" search includes: "Thesis" (n=13), "Digital Library" (n=3), "Repository" (n=1).

Further, we found that all the 75 universities analyzed are moving from standalone systems to integrated discovery platforms. The analysis of the library management systems and WSDS

revealed that ExLibris* was the most used discovery platform (37.3 percent), followed by EBSCO Discovery Services (17.3 percent), independent systems (17.3 percent) and SirsiDynix (8 percent). See the Table 3.

S. No.	Name of WSDS	Number	Percentage
1	ExLibris*	28	37.3
2	EBSCO Discovery Service	13	17.3
3	Independent [#]	13	17.3
4	SirsiDynix	6	8.0
5	Libsys	2	2.7
6	Encore	2	2.7
7	iLiswave	2	2.7
8	WorldCat	1	1.3
9	PAND	1	1.3
10	BSLC System	1	1.3
11	Transtech 2.2 T2	1	1.3
12	Sulcmis	1	1.3
13	Kosmos	1	1.3
14	Limedio	1	1.3
15	Webcat Plus	1	1.3
16	T-LineS6	1	1.3
	Total	75	100

Table 3. Number and percentage of websites using WSDS.

*ExLibris includes "Primo" (n=13), "Summon" (n=10), "Alma" (n=1). #Independent includes in-house library management systems, which could not be identified.

Use of web 2.0 applications

Web 2.0 applications widely applied were blogs, RSS, social networking sites, photo and video sharing media and instant messaging tools. Facebook was the most used application (61.3 percent), followed by RSS (53.3 percent), Twitter (46.7 percent), YouTube (37.3 percent), blogs (18.7 percent) and Instagram (17.3 percent); podcasting was found to be the least used at 4 percent. Figure 3 shows the top used web 2.0 applications and their types promoting library resources and services through content and tools (videos, posts and microblogs).

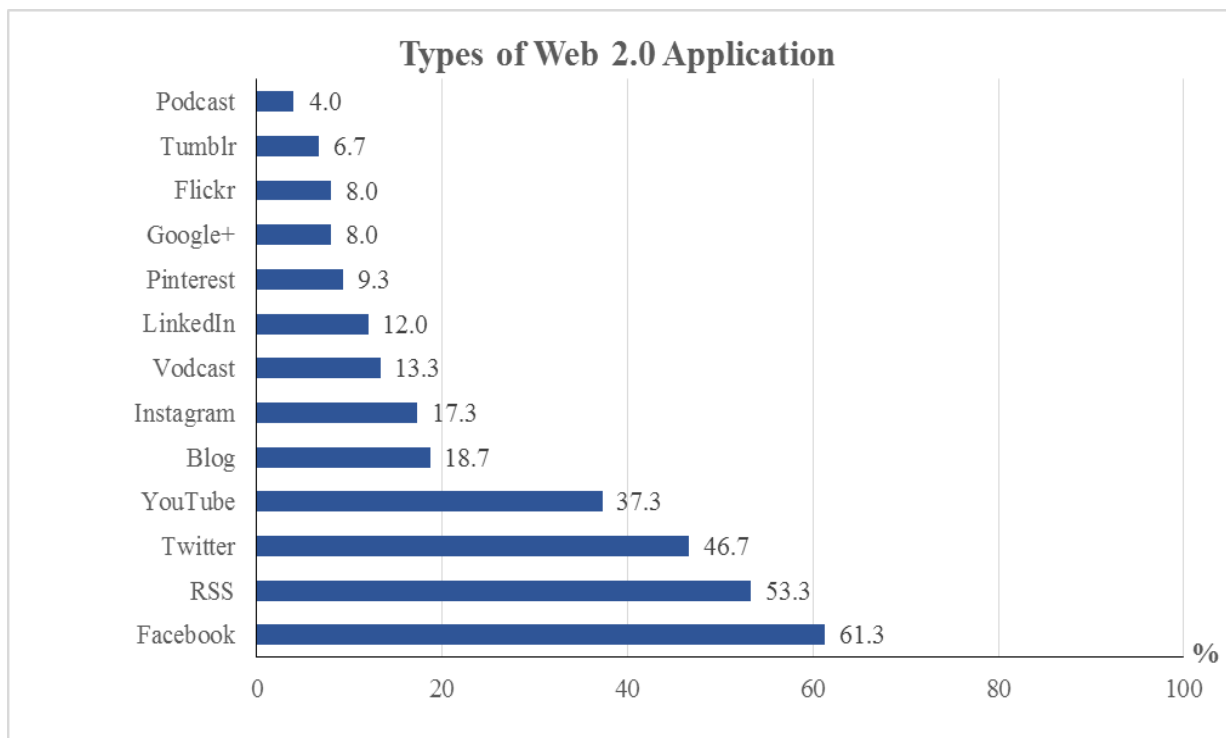


Figure 3. Types of Web 2.0 application

Blogging

In this study, we found that there were 14 (18.7 percent) universities using blogs in their library websites. Blogs are mainly used for informing news and events at the academic libraries, writing reviews, training for databases, teaching aids and software, products and upgrade; celebrating days of national and international importance; information literacy programmes and library orientation sessions for the various user groups associated with the academic institutions.

Rich Site Summary

Rich Site Summary (RSS) helps to track and read content updates on RSS readers instead of visiting original websites, syndicating all the new content available on various websites. Libraries are providing RSS-rich sites for tracking events and news, search results and new arrivals. In this analysis, we found that (53.3 percent) were using RSS and many WSDSs enable the RSS feeds even for search results. Multiple purpose of RSS is exhibited in Figure 4—RSS homepage of City University of Hong Kong for new arrivals, RSS feeds of News and Events at United Arab Emirates University Libraries and RSS feeds for search results at National University of Singapore Libraries in WSDS.

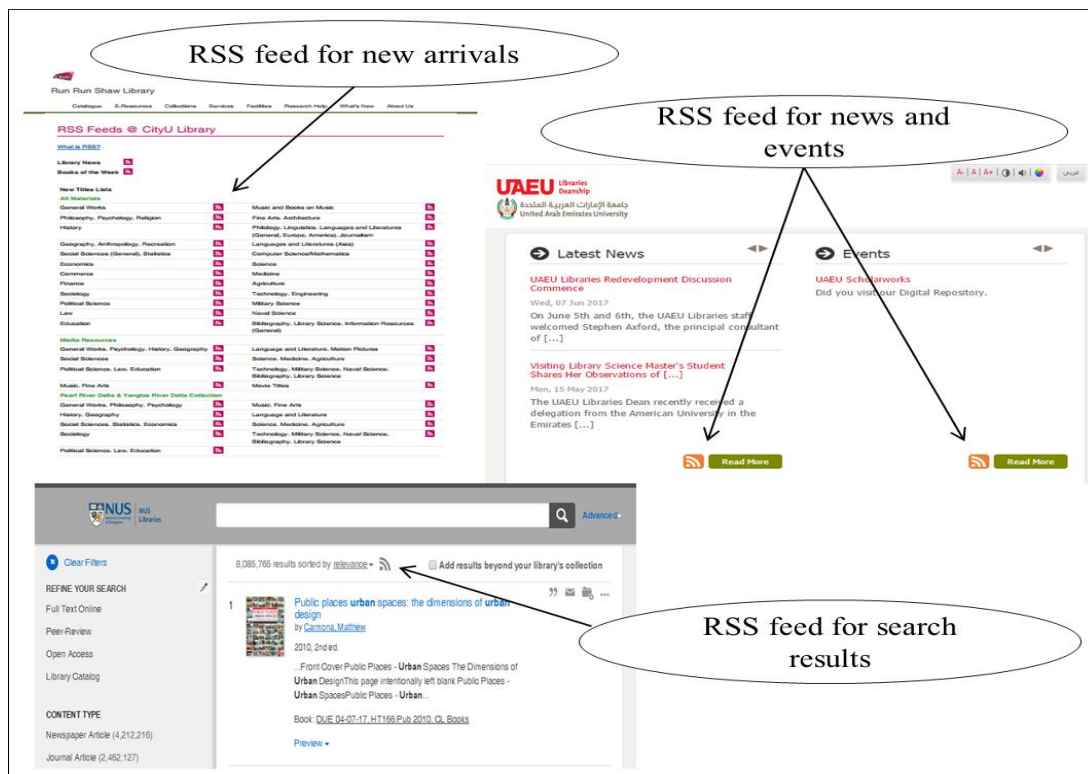


Figure 4. RSS use cases in libraries.

Social networking sites

Social networking sites are the most popular media for academic library services. Many university catalogues were found to have embedded social media at article/record level in WSDSs and at library websites. Presence of social media indicated that the catalogues had a set of social media tools or applications (e.g. Google Book Previews to share buttons like AddThis) and others. In this analysis of 75 universities, on an average 44 percent universities were using one or the other social media on their library websites. Facebook was the most used social media among 46 university libraries (61.3 percent) for promoting their resources, news, events through posts, newsfeeds and media (Figure 3). 35 university libraries (46.7 percent) were using Twitter as a popular microblogging site (Figure 5). 28 universities (37.3 percent) were using YouTube for videos on education, programmes, training, library promotions and e-learning tutorials, while 17 universities, had their own YouTube channel exclusively for libraries. Nine library websites had LinkedIn on their library websites (12 percent). Seven libraries (9.3 percent) were using Pinterest, six library websites embedded Google+ (8 percent) and five libraries (6.7 percent) were using Tumblr. Three libraries (4 percent) were using podcasting.

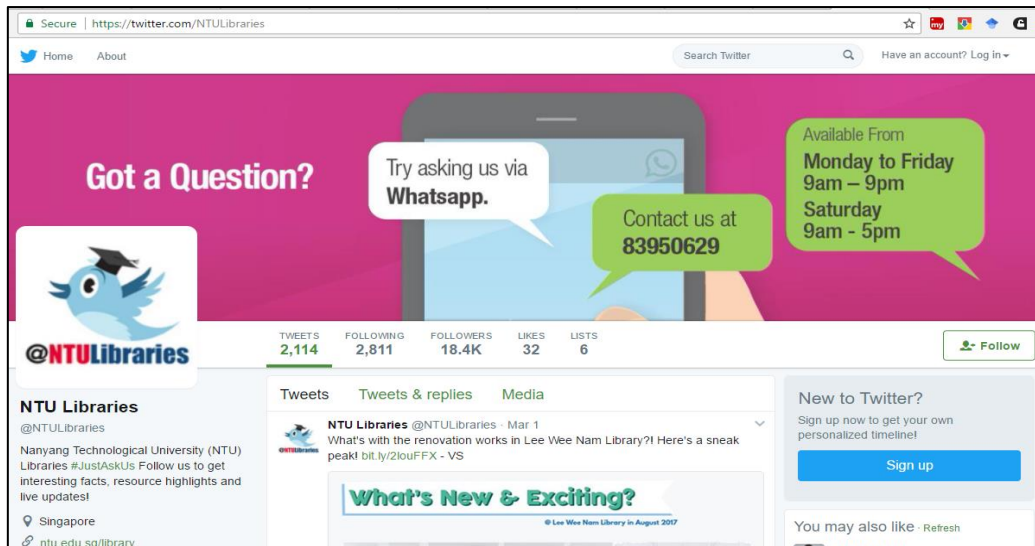


Figure 5. Use of Twitter at Nanyang Technological University Libraries.

Vodcasting was available in 10 libraries (13.3 percent), consisting of online tutorials, e-learning modules and instructional videos on using the library resources, infrastructure and facilities. Bilkent University Library has a tutorial site for the user instruction (Figure 6).



Figure 6. Vodcasting at Bilkent University.

Instagram as an image and video application is gaining traction as an emerging social media for sharing pictures and videos, as 13 universities (17.3 percent) were using Instagram on their library websites for sharing pictures of library resources, events and programmes (Figure 7). Six libraries were using Flickr at 8 percent (Figure 3). As social media became reference utilities some of the popular Twitter hashtags are #refdesk, #bookillustrationoftheday and Instagram tag #Bookfacefriday were creatively found to be enhancing the reference services. Figure 8 shows the top four university libraries highly active in social media activities on Twitter, Facebook and YouTube. This illustrates that YouTube is accounted for number of videos and subscribers, Facebook by number of likes, visitors and followers and Twitter based on number of followers and tweets of Hong Kong Baptist University, Korea Advanced Institute of Science and Technology, Middle East

Technical University and National University of Singapore. Twelve universities were found to be most active on Twitter through number of tweets and followers. Facebook by number of followers and likes (Figure 8).

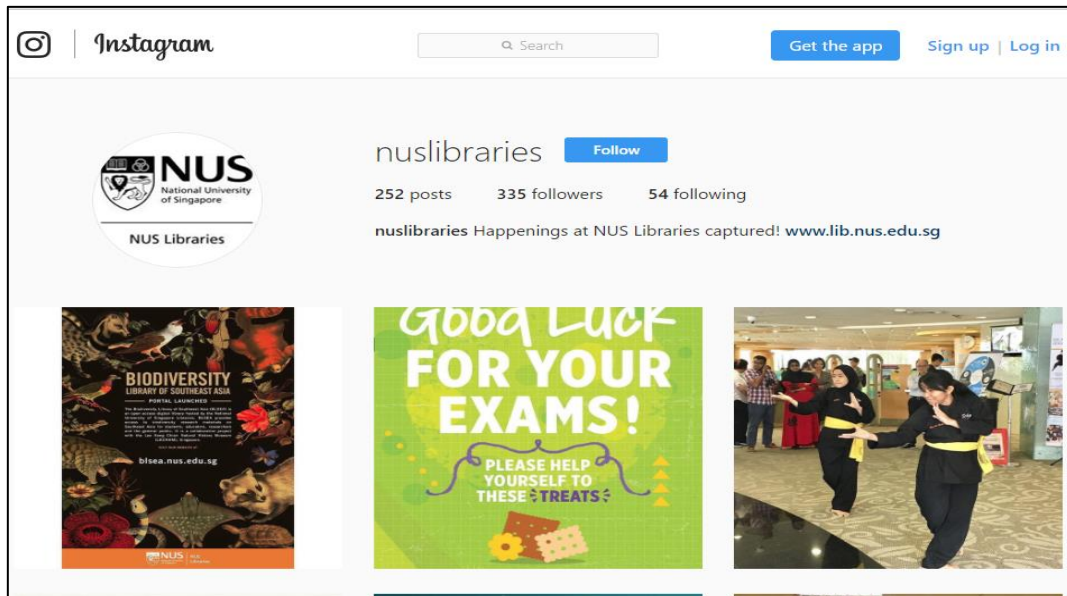


Figure 7. Instagram at NUS Libraries.

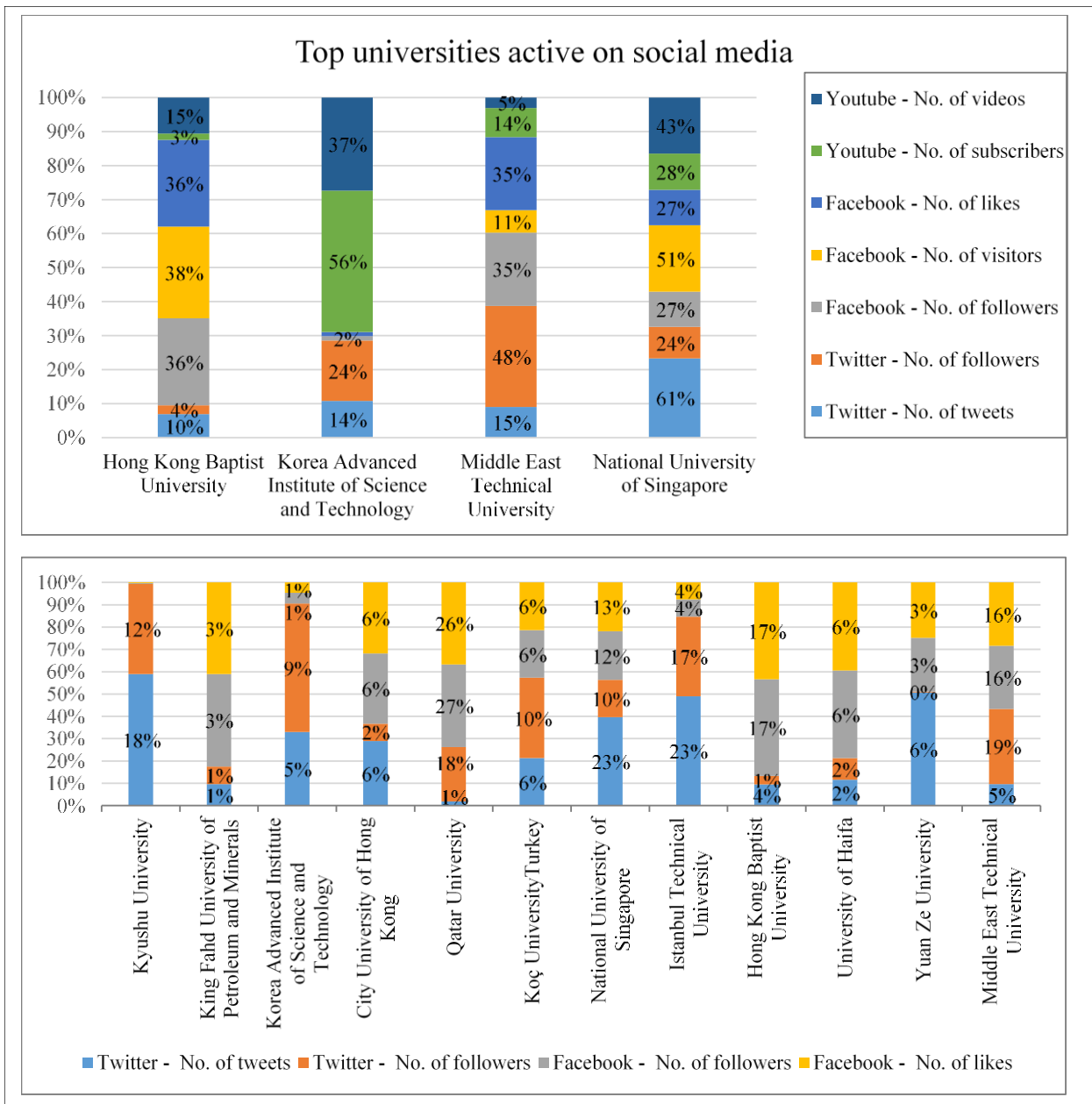


Figure 8. Top universities active on social media—Facebook, YouTube and Twitter.

Library guides

Library guides essentially includes course, database and subject guides and 37.7 percent of library websites were found to have integrated with microsites and web guides for learners and faculty on the library websites. See the example of Library Guides at The Hong Kong University of Science and Technology Library at Figure 9.

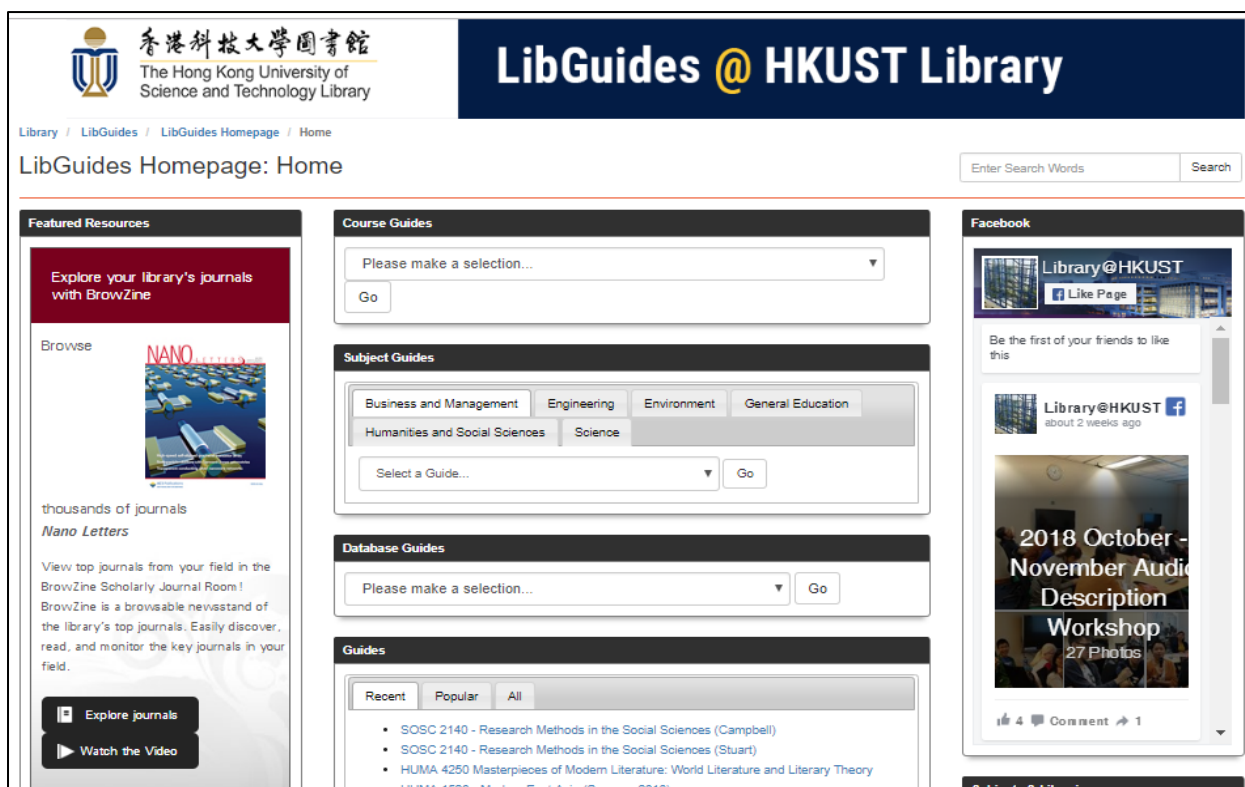


Figure 9. Library Guides at HKUST Library, Hong Kong.

Digital reference services

Overall percentage obtained for digital reference service is 23.1 percent. Though all the universities have the email support, instant messaging tools were used less as live help to address short questions and reference queries. We found that (5.3 percent) are using IM tools, which contradicts to an early study conducted by Harinarayana and Raju (2010), where IMs usage was high among 37 libraries. However, other applications such as WhatsApp, Google Hangout and library mobile apps have gained popularity in IMs on library websites. Two university libraries used Skype for video calls and chats.

Mobile web applications

As exhibited in Figure 10 the top most used mobile apps are QR code (26.7 percent), SMS (9.3 percent), WeChat (8 percent), WhatsApp (8 percent), iTunes U (6.7 percent) and Snapchat (1.3 percent). We observed that few libraries have their own Library Apps available for Android and iOS devices. This is to browse and search library websites, mobile catalogues and resources accessible through smartphones and for off-campus access, which can be used across Apple, Android and wearable devices (see: <https://www.uaeu.ac.ae/en/vc/doit/mobile>). See the mobile app of National Taiwan University exhibited at Figure 11. Many universities do technology lending allowing users—to borrow laptops, tablets and Kindle eBook readers from the libraries (See an example at: <http://www.lib.cuhk.edu.hk/en/use/borrowing/kindle>). Plurk and Line are other social media applications used across electronic devices in Asia.

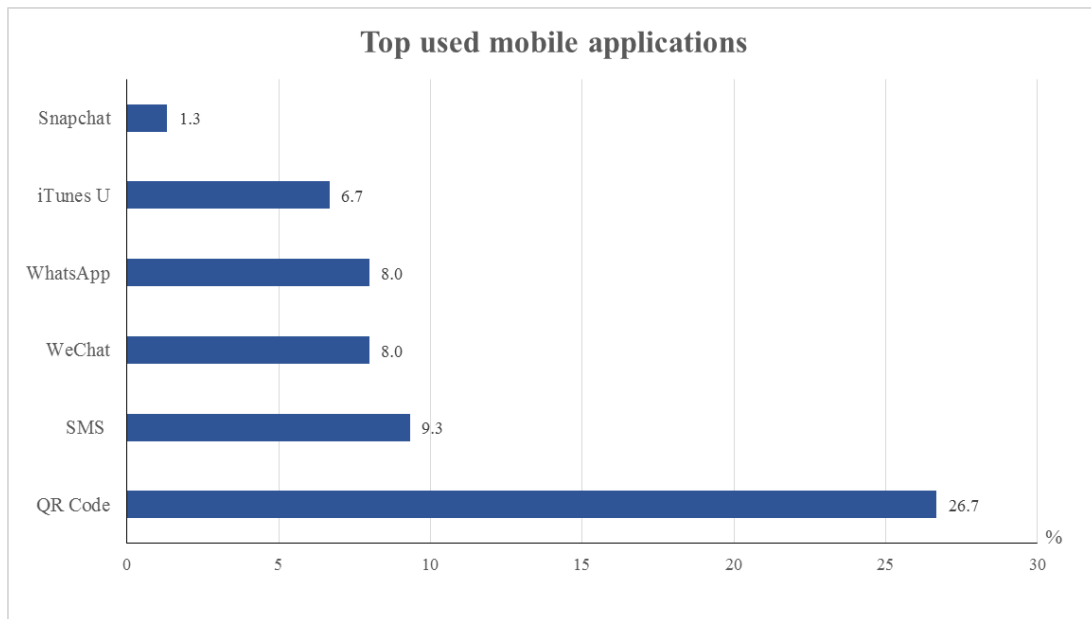


Figure 10. Top used mobile applications.

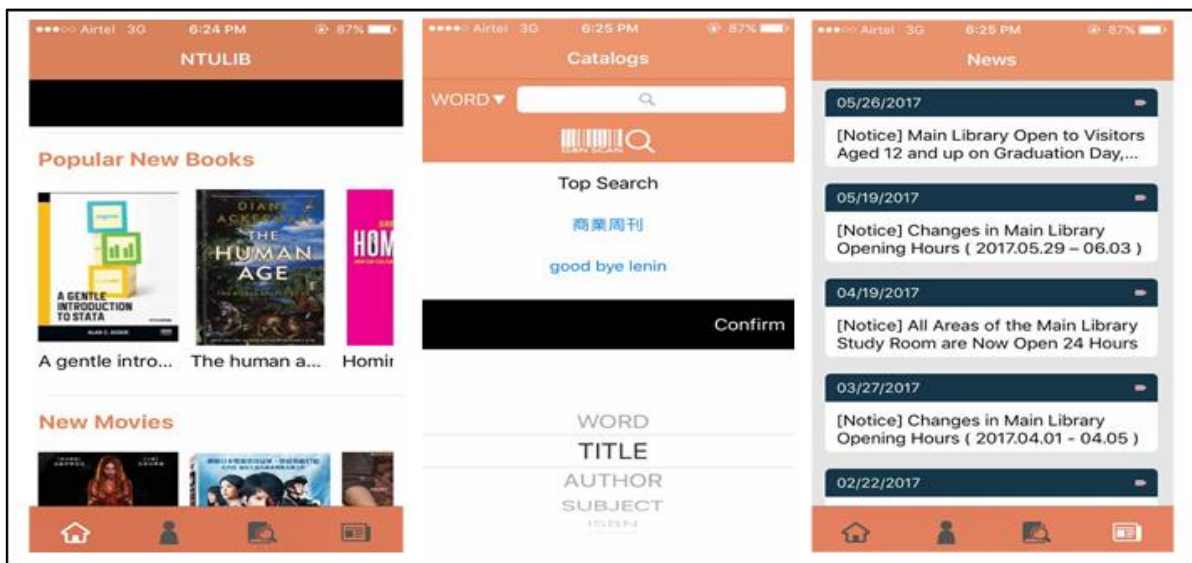


Figure 11. Library mobile app of National Taiwan University.

Digital inclusion

For web accessibility, many libraries were building inclusive academic spaces and special collections - audio books and question banks, especially for physically and visually challenged at 4.66 percent. Some of the prominent features for inclusive web accessibility are increasing font sizes, changing to contrasting colors and converter plugin from text to speech for special needs users. Younes & Soraya Nazarian Library at University of Haifa has a Learning Center for the Visually Impaired, demonstrating this for inclusion (See Figure 12). Keyboards with accesskeys were used at Library of National Taipei University of Technology designated as an alternative technology for people with disabilities. Speechmaking enabled at United Arab Emirates University Library website has a special plugin to read the content of the website by the ReadSpeaker application is available at: <http://www.library.uaeu.ac.ae/en>.

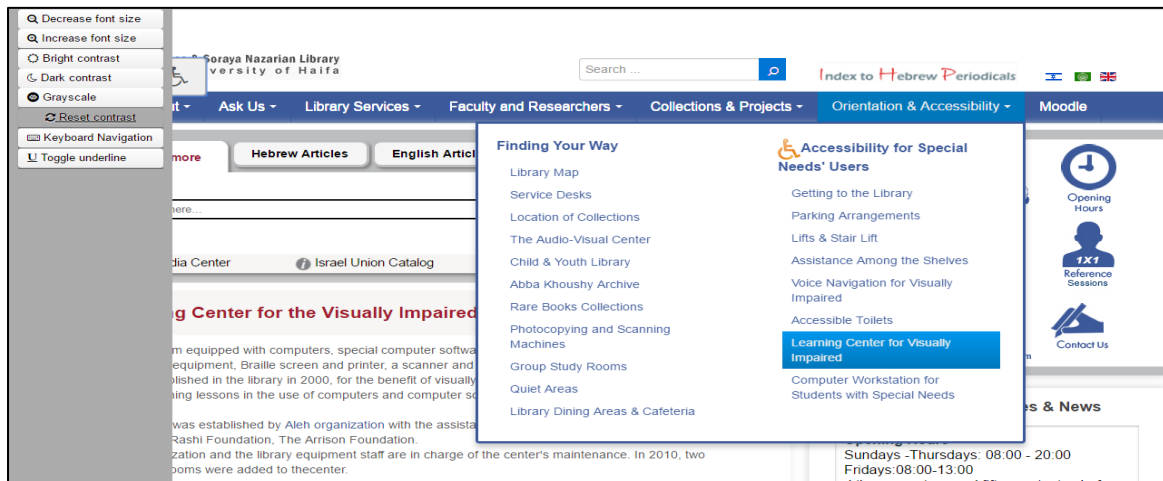


Figure 12. Learning Center for the Visually Impaired, Younes & Soraya Nazarian Library, University of Haifa.

Ranking of university libraries

Out of 75 universities, 43 universities got more than 40 scores and above, having rich content, intuitively enhanced and adopted web 2.0 applications to facilitate library users and 32 universities have less than 40 scores. In our rankings, we found that United Arab Emirates University scores the highest rank of 77 followed by Middle East Technical University (71.5). Universities that scored more than 60 scores are Sabanci University (69.5), Erciyes University (69.5), Istanbul Technical University (66.5), Istanbul University (65), Hacettepe University (64.5), Mahidol University (63), Boğaziçi University (62), King Abdulaziz University (62), Hong Kong University of Science and Technology (61.5), Chinese University of Hong Kong (61), National Taiwan University (61) and National Tsing Hua University (60). See Figure 13 below for the complete ranking and performances of the university library websites evaluated.

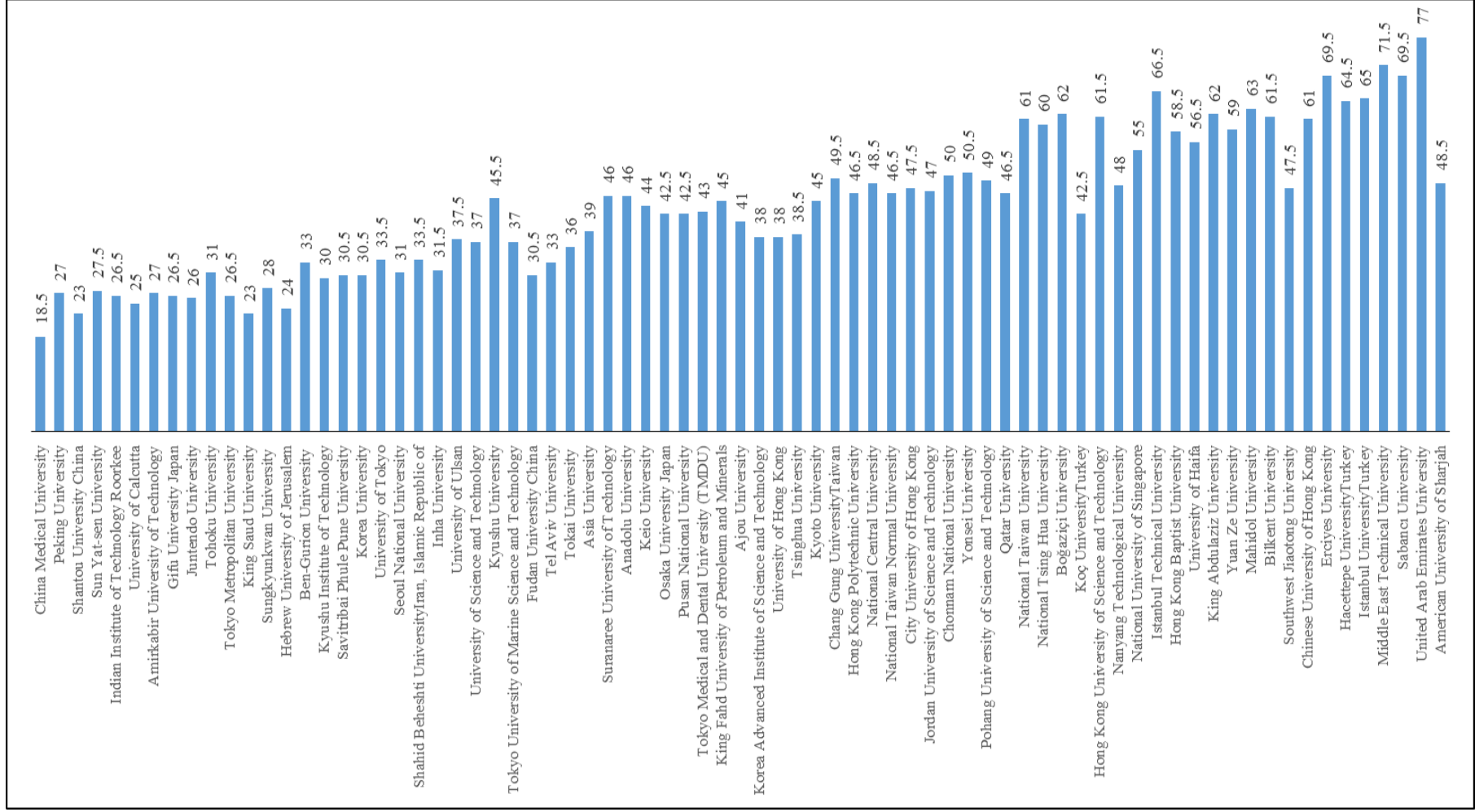


Figure 13. Scorecard of the 75 university library websites.

Conclusion

This analysis of web 2.0 applications demonstrated how academic library websites became central hubs adequate for essential information services to increase engagement of users. Web 2.0 is about collective intelligence and integrated web experience to connect people, concepts and applications. As such, how library websites can evaluate their own offerings through innovative design, website elements and web 2.0 applications for academic libraries supplement to the existing systems and infrastructure in a web environment is discussed. As academic library services go more and more web based using various applications for discoverability, access is no longer constrained by time and location. Hence, constantly innovating with disruptive technologies to revisit the academic library values is crucial. Since this opens up many opportunities to shape the future to demonstrate student learning and success, positing libraries at the heart of learning and development is essential, which has implications far beyond not only creating world class academic libraries, but also engages learning communities through social media and digital spaces. Web 2.0 applications and social media certainly influence the participation of students and faculty in the information services delivery and in enhancing the research impact and values of academic libraries. There is a consensus among the library community to identify and support academic resources through social media to drive change and to cater to different user groups. As mainstreaming of web based information services fast catching up, widespread adoption and diffusion of web 2.0 applications among Asian university libraries are evident. The present study identified few trends of how web 2.0 had been integrated into library services and our further research will focus on the scholarly web, web standards for user experience design, accessibility, discovery and applications ecosystem for academic libraries. The web 2.0 model has shaped academic librarianship tremendously and users with the advancements of web technologies towards collective intelligence and participatory development. As this evolves, we should examine emerging web 2.0 theories and applications to envisage the future of academic libraries. Best practices, risks and policies involved, challenges and lessons learned for using web 2.0 applications from developed countries will help Asian libraries to move forward. Moreover, if academic libraries are proactive in their approaches to serve the users better, their services and innovation will revolve around web 2.0 applications for implementation.

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Appendix I: List of the 75 Asian university libraries

S. No	Asian rankings	University name	Country	URL
1	46	China Medical University	Taiwan	http://lib.cmu.edu.tw/english
2	2	Peking University	China	http://eng.lib.pku.edu.cn
3	161-170	Shantou University	China	http://www.lib.stu.edu.cn/eng
4	40	Sun Yat-sen University	China	http://202.116.65.75/web/EN
5	65	Indian Institute of Technology Roorkee	India	http://mgcl.iitr.ac.in
6	141-150	University of Calcutta	India	http://www.caluniv.ac.in/libraries/library.html
7	76	Amirkabir University of Technology	Iran	http://library.aut.ac.ir/index_percent20English.html
8	151-160	Gifu University	Japan	http://www1.gifu-u.ac.jp/~gulib/Eng/Welcome.html
9	111-120	Juntendo University	Japan	http://www.juntendo.ac.jp/english/library
10	23	Tohoku University	Japan	http://www.library.tohoku.ac.jp/en
11	52	Tokyo Metropolitan University	Japan	http://www.lib.tmu.ac.jp/english/index.html
12	96	King Saud University	Saudi Arabia	http://library.ksu.edu.sa/en
13	12	Sungkyunkwan University	South Korea	https://lib.skku.edu/en/
14	17	Hebrew University of Jerusalem	Israel	http://lib-authority.huji.ac.il/eng/index.htm
15	79	Ben-Gurion University of the Negev	Israel	http://in.bgu.ac.il/en/aranne/Pages/default.aspx
16	171-180	Kyushu Institute of Technology	Japan	https://www.kyutech.ac.jp/english/library_facilities/library
17	141-150	Savitribai Phule Pune University	India	http://lib.unipune.ac.in:8002/jl
18	17	Korea University	South Korea	http://library.korea.ac.kr
19	7	University of Tokyo	Japan	http://www.lib.u-tokyo.ac.jp/index-e.html
20	9	Seoul National University	South Korea	http://library.snu.ac.kr/?language=en
21	151-160	Shahid Beheshti University	Iran	http://library.sbu.ac.ir
22	101-110	Inha University	South Korea	http://lib.inha.ac.kr/eng
23	52	University of Ulsan	South Korea	http://library.ulsan.ac.kr/en/index.ax
24	121-130	University of Science and Technology Beijing	Beijing, China	http://lib.ustb.edu.cn
25	48	Kyushu University	Japan	https://www.lib.kyushu-u.ac.jp/en
26	161-170	Tokyo University of Marine Science and Technology	Japan	http://lib.s.kaiyodai.ac.jp/?lang=english
27	19	Fudan University	China	http://www.library.fudan.edu.cn/main_en/index.htm
28	20	Tel Aviv University	Israel	https://en-libraries.tau.ac.il
29	191-200	Tokai University	Japan	http://www.tsc.u-tokai.ac.jp/ctosho/lib-e/tosho-e.htm
30	131-140	Asia University, Taiwan	Taiwan	http://library.asia.edu.tw/bin/home.php?Lang=en
31	161-170	Suranaree University of Technology	Thailand	http://library.sut.ac.th/clremsite/?m=homepage
32	131-140	Anadolu University	Turkey	http://kdm.anadolu.edu.tr
33	111-120	Keio University	Japan	http://www.lib.keio.ac.jp/en
34	30	Osaka University	Japan	http://www.library.osaka-u.ac.jp/index_eng.php
35	84	Pusan National University	South Korea	https://lib.pusan.ac.kr/en
36	59	Tokyo Medical and Dental University (TMDU)	Japan	http://www.tmd.ac.jp/english/lib
37	66	King Fahd University of Petroleum and Minerals	Saudi Arabia	http://www.kfupm.edu.sa/deanships/library/Pages/Default.aspx
38	141-150	Ajou University	South Korea	http://englib.ajou.ac.kr/en/index.ax
39	10	Korea Advanced Institute of Science and Technology (KAIST)	South Korea	https://library.kaist.ac.kr/main.do#

40	4	University of Hong Kong	Hong Kong	http://lib.hku.hk
41	5	Tsinghua University	China	http://eng.lib.tsinghua.edu.cn/default.html
42	11	Kyoto University	Japan	http://www.kulib.kyoto-u.ac.jp/?ml&lang=en
43	101-110	Chang Gung University	Taiwan	http://library.cgu.edu.tw/bin/home.php?Lang=en
44	22	Hong Kong Polytechnic University	Hong Kong	https://www.lib.polyu.edu.hk
45	94	National Central University	Taiwan	http://www.lib.ncu.edu.tw/en
46	68	National Taiwan Normal University	Taiwan	http://www.lib.ntnu.edu.tw/english
47	16	City University of Hong Kong	Hong Kong	http://www.cityu.edu.hk/lib
48	181-190	Jordan University of Science and Technology	Jordan	http://just.edu.jo/library/Pages/default.aspx
49	151-160	Chonnam National University	South Korea	http://lib.jnu.ac.kr
50	37	Yonsei University	South Korea	http://library.yonsei.ac.kr
51	8	Pohang University of Science and Technology	South Korea	http://library.postech.ac.kr/?language=en
52	121-130	Qatar University	Qatar	http://library.qu.edu.qa/en/#.WOIxOfmGPIU
53	15	National Taiwan University	Taiwan	http://www.lib.ntu.edu.tw/en
54	35	National Tsing Hua University	Taiwan	http://www.lib.nthu.edu.tw/en
55	64	Boğaziçi University	Turkey	http://www.library.boun.edu.tr/en
56	21	Koç University	Turkey	http://library.ku.edu.tr/en
57	6	Hong Kong University of Science and Technology	Hong Kong	http://library.ust.hk
58	2	Nanyang Technological University	Singapore	http://www.ntu.edu.sg/Library/Pages/default.aspx
59	1	National University of Singapore	Singapore	http://libportal.nus.edu.sg/frontend/index
60	91	Istanbul Technical University	Turkey	http://www.library.itu.edu.tr/en/home
61	44	Hong Kong Baptist University	Hong Kong	http://library.hkbu.edu.hk/main/index.php
62	87	University of Haifa	Israel	http://lib.haifa.ac.il/index.php/en
63	26	King Abdulaziz University	Saudi Arabia	http://library.kau.edu.sa/Default.aspx?Site_ID=212&Lng=EN
64	121-130	Yuan Ze University	Taiwan	https://www.yzu.edu.tw/index.php/en-us
65	90	Mahidol University	Thailand	https://library.mahidol.ac.th
66	45	Bilkent University	Turkey	http://library.bilkent.edu.tr
67	181-190	Southwest Jiaotong University	China	http://www.lib.swjtu.edu.cn/ArticleChannel.aspx?ChannelID=56
68	13	Chinese University of Hong Kong	Hong Kong	http://www.lib.cuhk.edu.hk/en
69	191-200	Erciyes University	Turkey	http://kutuphane.erciyes.edu.tr
70	171-180	Hacettepe University	Turkey	http://library.hacettepe.edu.tr/page/GeneralInformation
71	99	Istanbul University	Turkey	http://kutuphane.istanbul.edu.tr/en/?p=6714
72	94	Middle East Technical University	Turkey	https://lib.metu.edu.tr
73	38	Sabancı University	Turkey	http://www.sabanciuniv.edu/bm
74	101-110	United Arab Emirates University	United Arab Emirates	http://www.library.uaeu.ac.ae/en
75	161-170	American University of Sharjah	United Arab Emirates	http://library.aus.edu

Appendix II: Library Web Service Index

Procedure:

1. For each subindicator that is available on the website being evaluated, placing a checkmark, weight was given.
2. Within each indicator, add the subindicator weights of all the universities, divide the total by total number of universities (n=75) and multiply by subindicator weight.
3. Subindicator and group weights sum to 100.

	Group	Indicator	Subindicator	Subindicator weight	Group weight
1	Resource discovery tools	OPAC	Web-OPAC	3	20
			Web-OPAC in English	4	
		LMS/WSDS	Integrated	6	
			Standalone	4	
		Search Engines	Web site search	3	
2	Web 2.0	Blog	blogs	3	20
		RSS	RSS	4	
		Social networking sites	Twitter	2	
			Facebook	2	
			Instagram	2	
		Photo and video tools	YouTube	2	
			Podcast	2	
		Vodcast	2		
Other social media	Weibo, LinkedIn, Pinterest, Google+, Flickr, Tumblr	1			
3	e-Resources	E-books, E-journals, Databases		5	20
		E-learning / personalized system		3	
		Electronic gateways		3	
		Digital repository - ETDs		5	
		Arts/Heritage/Gallery/Museum digital collections		4	
4	Mobile apps	WhatsApp		3.5	15
		WeChat		3.5	
		SMS		3	
		QR Code		1	
		Library apps (Others)		4	
5	Library guides	Subject guides		2.5	10
		FAQs / Q&A sites		2.5	
		Content marketing		2.5	
		Sitemaps / Site index		2.5	
6	Digital reference services	Email		3	10
		Web form		2	
		IMs/Chat boxes		3	
		Skype		2	
7	Digital inclusion	Color-disabled		2.5	5
		Physically challenged		2.5	

	Total	100
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