Web-based Application Programming Interface (Web APIs): Vacancies in Iranian Public Library Websites

Hamid Reza Saeidnia

Msc, Information Management, Department of Knowledge and Information Science, Tarbiat Modares University, (TMU) Tehran, Iran. E-mail: hamidrezasaednia@gmail.com; ORCID: 0000-0001-5430-2416

Ali Ghorbi*

Department of Knowledge and Information Science, Faculty of Management, University of Tehran, Tehran, Iran. ORCID: 0000-0003-1411-575X

Marcin Kozak

Department of Media, Journalism and Social Communication, University of Information Technology and Management in Rzeszow. ORCID: 0000-0001-9653-3108

Shadi Abdoli

B.Sc. Information Science, Information Science Department, Allameh Tabataba'i Univesity, Tehran, Iran.
Honorary VIP Erasmus + International Student at Justus Liebig University Giessen, Hessen, Germany. ORCID: 0000-0003-0176-8532

Abstract

Application Programming Interfaces (APIs) are software tools that help different programs work together. APIs can improve an organization's presence on the Web with tools that integrate various useful, popular programs. This study aimed to identify appropriate web-based APIs used by the most popular public library websites for presentation on Iranian public libraries' websites. For this purpose, we conducted this study in two stages: In stage one, Web APIs were identified by reviewing the websites of the top public libraries in the world. Then, in stage two, using the obtained results, important Web APIs were selected utilizing experts' opinions (the heuristic method). In stage one, the 30 Web APIs in two categories were identified: 10 public Web APIs and 20 private Web APIs. Then, in stage two, 7 public APIs and 17 private Web APIs for these websites were selected, based on expert analysis. The results of this study can be used to improve the design of public library websites and enhance the communication of such websites' presence on the Web.

Keywords

Public library, Website, Web APIs.

Introduction

An Application Programming Interface (API) is a manual programming tool to describe how an application accesses another function (Cerf, 2019). An API is considered a set of descriptive, clear techniques to create communication between different software components (Courage & Saroop, 2015), an expression first used in 1968 (Cotton & Greatorex Jr, 1968). The function of an API is to make it easier to use certain technologies to construct software for developers (Cerf, 2019). Just as a graphical user interface makes it easy for the user to use the software, an API serves the same purpose for software developers (Mahiddini, 2017).

One of the uses of APIs is developing websites, which is known as a web programming interface, or a Web API (Boyd, 2014). Web APIs allow us to combine multiple programming interfaces into new software; this technique is also known as Mashup. For example, programming interfaces have made it easier to share content and data between users and applications (Benslimane et al., 2008).

Institutions can be more effective in developing their websites using Web APIs (Michel, 2013). The use of Web APIs on a library website allows for the expansion of web-based services, use of this information on a larger scale, and maintaining a competitive position compared to other information providers (Davis, 2016; Michel, 2013).

So far, many types of research have been suggested to study the use of widgets or APIs to increase the usability of library websites. In a 2008 study, Meier described the benefits of using chat widgets on library websites, and how they affect everyday work and organizational culture. Meier also found that web-based APIs and chat widgets can be powerful communication tools on websites and web-based interfaces, allowing for point-of-need contact with users (Meier, 2008).

In a 2011 study, Sharpe and Gallagher developed a web-based API for inter-library loans and loan copyright payments. They knew that the current method of submitting website requests required their web submission interface, which was time-consuming and placed a heavy burden on staff resources. For this reason, they developed a web-based application to automatically retrieve, validate, and submit requests using private APIs. As a result of

developing this web-based API, they were able to save nearly 500 hours a year on staff time (Sharpe & Gallagher, 2011).

A study by Johnston introduced and described the use of the OCLC WorldCat API. She described the result of using this API as "Finally, our holdings reflect what we actually own" (Johnston, 2015). In another study, Eaton built an interactive visualization of his institution's collections using the Primo API from Ex Libris. When a user enters a search term, a "bubble" visualization of its location in the collection appears, based on its Library of Congress classification number, year of creation, or subject heading. As a result, Eaton was able to utilize the collected data to develop a more visual approach to exploring library holdings (Eaton, 2017).

According to the literature review, Web APIs can enhance the quality of presentation and functionality of library websites by applying unique features. With these improvements in the quality of library websites, users will be more likely to use these website, and the websites will function more efficiently on the web. Therefore, the use of Web APIs for public library websites offers users a more user-friendly way to access information. However, despite the increasing number of global public libraries making their websites available to all on the World Wide Web, many websites cannot provide a comprehensive overview of the types of facilities, services, and resources that users need.

Iranian public library websites have been studied across many types of research. The results of much of this research have indicated that websites must progress both quantitatively and qualitatively (Nazari & Bigdeli, 2014; Saeidnia, 2019). In Iran, public libraries now recognize the necessity and importance of their websites. However, many of these libraries are still in their infancy, and the websites of such libraries often have various defects and issues (Saeidnia, 2019). Thus, many Iranian public library websites have not yet started using Web APIs. Web APIs, which have been used for many years on most library websites across the world, have strengthened the presence of libraries on the web and greatly increased the availability of library services (Michel, 2013). Therefore, this study aimed to identify Web APIs used in top public libraries of the world and present these Web APIs for use on Iranian public libraries' websites. These APIs would improve the performance and presence of Iranian public library websites.

Methods

This is an analytical-descriptive study conducted in two stages in 2021 using the heuristic method.

1. Stage One

In this stage, we reviewed the websites of public libraries to obtain the Web APIs used in the world's public libraries. For this purpose, we used lists of public libraries available in the European Bureau of Library, Information and Documentation Associations (EBLIDA, 2020) and the Public Library Association (PLA, 2020). Within these two lists, small libraries (e.g., libraries in which you can take a book and leave a book) were ignored. We considered input criteria to be well-designed public websites. Inclusion criteria were: desirable regional site rank, at least two public and one private Web API, at least 100 daily visitors, and up-to-date website information and content.

2. Stage Two

In this stage, we passed the list of the obtained Web APIs to five experts (Table 1), who were asked to score each Web API from 1 to 5, based on the Likert scale (1 = strongly disagree, 5 = strongly agree), for each Web API that is suitable for Iranian library websites. If any of the identified Web APIs had a mean score above 2.5, it was deemed a suitable and compatible Web API for Iranian library websites. Finally, we analyzed the data using IBM SPSS statistical software (version 19, Armonk, USA).

Table 1 Experts' API characteristic ratings

	Expert 1 (pilot)	**Expert 2**	**Expert 3**	**Expert 4**	**Expert 5**
Sex	Male	Female	Female	Female	Male
Age	28	27	31	42	48
Education	MSc in Engineering (Information Management)	MSc in Engineering (Information Technology)	MSc in (library and information science)	PhD in (library and information science)	PhD in (library and information science)
Profession	Website developer	Website developer	PhD fellow	Assistant professor	Assistant professor

Results

1. General Specifications

In the first stage of this study, each of the Web APIs (public and private) were identified for the public library websites. For this purpose, 221 public library websites were checked, and after excluding 103 small public libraries, the remaining 118 public library websites were selected. After applying the inclusion criteria, 105 public library websites were removed, and 13 public library websites were included in the final study (Table 2). The PRISMA diagram shows the steps of the public library website selection (Figure 1).
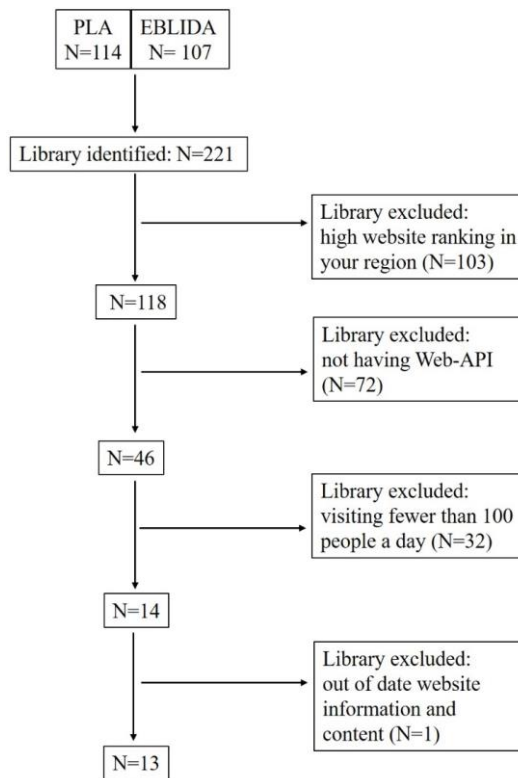
Figure 1 PRISMA diagram represents the processing and selection of public library websites

Table 2 List of public library websites analyzed

No.	Title Library	Web-APIs Public	Web-APIs Private	URL Public library
1	Helsinki City Library	Facebook, Twitter, Email	E-services, Services on map, Citizen safety information, Journey Planner	https://www.hel.fi/helsinki/en
2	Los Angeles	Facebook, Instagram, YouTube, Twitter, Snap chat	Books & E-Media Education & Research, Goodreads	https://www.lapl.org/
3	Multnomah County	Twitter, Facebook, Google Plus, Tumblr, YouTube, Flickr ,Pinterest ,Instagram, Email	RSS, Mobile app	https://multcolib.org/
4	Louis County	Facebook, Instagram, YouTube, Twitter	E-Media, E-Courses, Mobile app	http://slcl.org
5	Salt Lake City	Twitter, Facebook, YouTube, Pinterest, Instagram	Library App, virtual meeting	https://www.slcpl.org/
6	Carnegie Library	Facebook, Twitter, Instagram, YouTube, Linkedin	Stream and Download	https://www.carnegielibrary.org/
7	Topeka and Shawnee County	Facebook, Instagram, YouTube, Twitter, Flickr	Learning resources, Digital Library, Goodreads	https://tscpl.org/
8	Cleveland	Twitter, Facebook, Instagram, Pinterest, YouTube, Linkedin	E-Books ,Audiobooks Magazines ,Newspapers, Movies, TV Shows,	https://cpl.org/
9	Scottsdale	Facebook, Instagram, YouTube, Twitter.	Online Tutorials, Goodreads, E-Newsletters	https://www.scottsdalelibrary.org
10	Iowa City	Facebook, Twitter, Instagram, YouTube	Podcasts, Donate, Digital Library	https://www.icpl.org/
11	Spear wood	Facebook, Instagram, Twitter, YouTube	E-Books, E-Audiobooks, E-Magazines, and streaming movies, E-Newsletter	http://library.cockburn.wa.gov.au
12	Lawrence	Twitter, Facebook, Tumblr, YouTube, Flickr, Pinterest ,Instagram	virtual meeting, Digital Titles	https://lplks.org/
13	Birmingham	Facebook, YouTube, Twitter.	language learning system, text messaging service, Sellers Club video streaming platform	http://www.bplonline.org/

2. Sort and Points

A set of Web APIs for public library websites were identified in two categories: public Web APIs (10 items) and private Web APIs (20 items) (Tables 3 and 4).

In the second stage of this study, the identified Web APIs were scored by experts. In the public Web API category, social networks, Instagram, and email service received full points (Table 3). In the private category, online tutorials, e-media, and the social network "Goodreads" also received full points (Table 4).

Table 3 List of public Web APIs

Web-APIs Public	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5	Mean	Status
Instagram	5	5	5	5	5	5	✓
Email	5	5	5	5	5	5	✓
Linkedin	4	4	5	5	5	4.6	✓
Twitter	4	4	4	5	5	4.4	✓
Facebook	4	4	4	5	4	4.2	✓
YouTube	5	5	4	4	4	3.8	✓
Google Plus	4	3	4	4	3	3.6	✓
Pinterest	3	1	3	2	3	2.4	*
Flickr	3	3	2	1	2	2.2	*
Tumblr	3	3	2	2	1	2.2	*

- ● = Selected Items; * = Removed Items

Table 4 List of privateWeb APIs

Web-APIs Private	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5	Mean	Status
Online Tutorials	5	5	5	5	5	5	✓
E-Media (i.e. eBooks, Audiobooks, Podcasts, Music, Movies)	5	5	5	5	5	5	✓
Goodreads	5	5	5	5	5	5	✓
Virtual meeting	5	4	5	5	5	4.8	✓
RSS	5	4	5	5	5	4.8	✓
E-Courses	4	5	5	5	4	4.6	✓
Services on map	4	4	4	5	5	4.4	✓
Citizen safety information	4	5	4	4	4	4.2	✓
Journey Planner	4	4	4	4	4	4	✓
Education & Research	4	4	3	4	5	4	✓
Mobile app	3	3	4	5	5	4	✓
Stream and Download	3	3	4	4	4	3.6	✓
Learning resources	3	3	4	3	4	3.4	✓
Digital Library	4	3	3	3	4	3.4	✓
Newspapers	3	3	3	3	4	3.2	✓
TV Shows	4	3	3	4	3	3.2	✓
E-Newsletters	3	2	3	3	4	3	✓
Donate	2	2	3	3	2	2.4	*
Text messaging service	2	2	2	2	3	2.2	*
Sellers Club	2	1	2	2	3	2	*

- ● = Selected Items; * = Removed Items

Discussion

This study aimed to identify Web APIs that could be useful for Iranian public library websites. From the public Web APIs category of 10 identified cases, the experts selected seven. Instagram and LinkedIn achieved perfect scores, a result highlighting the importance of using social networks on public library websites. Maness (2006) described the use of social networks on library websites as a promising and pleasant feature. He considers messaging, blogging, streaming media, and tagging capabilities as some of the most important features of social networks that can also be very effective in enhancing the services of library websites. Furthermore, the use of social network web APIs will increase libraries' capabilities to view, and share their resources, and events (Michel, 2013).

From the private Web APIs category of 20 identified cases, the experts selected 17. In this category, online courses earned the highest (and full) score. This feature is very popular, as more than half of the graduates in the last decade have taken and passed at least one online course (Halpern & Tucker, 2014). Accordingly, the use of Web APIs in this area can greatly increase the number of learners accessing library websites (Hartog, 2018).

Another private Web API that achieved the full score from the experts was web media. Generally, web media can be defined as text, audio, and visual communication that may be presented on the web (MDN, 2020). The use of web media features using existing APIs (e.g. Media Capabilities, Media Capture and Streams, Web Audio, etc.) will increase the number of users of library websites (Maness, 2006; MDN, 2020).

Among private Web APIs, the Goodreads social network also achieved the highest score. Goodreads is a dedicated social network for book readers, and its API is available for various uses from the developer's website (Goodreads, 2020). Library website users can use the Goodreads Web API to easily access this social network, through which they can interact, share and recommend library resources (Michel, 2013).

Most of the items in the private Web APIs category scored 2.5 points or more from the experts, with the exception of Donate, Text messaging services, and Sellers Club. Since a private Web API is an API that has its application hosted by in-house developers (Maleshkova et al., 2010), its development can depend on the policy and type of activity of the public library's website.

Conclusion

According to the findings of this study, Web APIs can help public library websites to enhance the offer of their features, to increase the website's activity, and to strengthen the

library's presence online. These results can be considered by managers and officials of public libraries' websites, and can be used to improve the design and communication of such websites.

Conflict of Interests

The authors declare to have no conflicts of interest with the manuscript.

References

Benslimane, D., Dustdar, S., & Sheth, A. (2008). Services mashups: The new generation of web applications. *IEEE Internet Computing*, *12*(5), 13-15.

Cerf, V.G. (2019). APIs, standards, and enabling infrastructure. *Communications of the ACM*.

Cotton, I.W., & Greatorex Jr, F.S. (1968). Data structures and techniques for remote computer graphics. *In Proceedings of the December 9-11, 1968, fall joint computer conference, part I,* 533-544.

Davis, R.C. (2016). APIs and Libraries. *Behavioral & Social Sciences Librarian*, *35*(4), 192-195.

Eaton, M. (2017). Seeing Library Data: A Prototype Data Visualization Application for Librarians. *Journal of Web Librarianship*, *11*(1), 69-78.
https://doi.org/10.1080/19322909.2016.1239236

EBLIDA. (2020). *EBLIDA Members*. 5 November 2020.
http://www.eblida.org/membership/eblida-members.html

Goodreads. (2020). *API*. Goodreads. January 27, 2021. https://www.goodreads.com/api

Halpern, R., & Tucker, C. (2014). Leveraging adult learning theory with online tutorials.

Hartog, P.A. (2018). Online Library Tutorials: A Literature Review. *The Christian Librarian*, *61*(2).

Johnston, S. (2015). Homegrown WorldCat reclamation: utilizing OCLC's WorldCat metadata API to reconcile your library's holdings. *Code4Lib Journal* (27).

Mahiddini, P. (2017). *Dynamic application programming interface publication for providing web services*.

Maleshkova, M., Pedrinaci, C., & Domingue, J. (2010, December). Investigating web apis on the world wide web. *In eighth ieee european conference on web services,* 107-114.

Maness, J.M. (2006). Library 2.0 theory: Web 2.0 and its implications for libraries. *Webology*, *3*(2).

MDN. (2020, Dec 20, 2020). *Web media technologies*. MDN web docs. Jun 10, 2021.
https://developer.mozilla.org/en-US/docs/Web/Media

Meier, J.J. (2008). Chat Widgets on the Library Website: Help at the Point of Need. *Computers in libraries*, *28*(6).

Michel, J.P. (2013). *Web service APIs and libraries*. American Library Association.

Nazari, L., & Bigdeli, Z. (2014). A comparison of the content attributes of Iranian public library websites with those of other countries based on the attitudes of public librarians. *The Quarterly Journal of Iran Public Libraries Foundation ISSN*, *1027*, 7838.

PLA. (2020). *Member Center*. ALA American Library Association. January 26, 2021. http://www.ala.org/pla/membercenter

Saeidnia, H.R. (2019). Identification and classification of the features of an effective website for Iranian Public Libraries based on the Kano Model Customer Satisfaction. *Knowledge Studies*, *5*(19), 63-88.

Sharpe, J., & Gallagher, P. (2011). Developing a web API for interlibrary loan copyright payments. *Journal of Interlibrary Loan, Document Delivery & Electronic Reserve*, *21*(3), 133-139.

Noruzi, A. (2018). Folks thesauri or search thesauri: Why semantic search engines need Folks Thesauri?. *Webology, 15*(2), 1-10.