

## **SPEECH RECOGNITION TECHNOLOGY FOR OPAC SERVICE: AN INNOVATIVE IDEA FOR INDIAN LIBRARIES**

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The Information and Communication Technology (ICT) driven environment compelled to software engineers and professionals to work harder to meet out the expectations of the people needs and requirements. The smartphone savvy generation is more acquainted with application based software systems along with standard and smart search platforms. They are shifting from text-based search to voice search. 'OK Google' and 'Hey Alexa' are prominent voice services brought by Google and Amazon to attract their customers towards their products and make their life easy in searching and retrieving information. The authors found it equally good for library services. The talking Web-OPAC could be emerged as one of the innovative ideas to facilitate search services in the libraries. The author try to highlight some issues and concerns over talking Web-OPAC in libraries.

**Keywords:** Speech Recognition Technology, Voice Search, Web-OPAC, Mobile Technology, OK Google, Hey Alexa.

### **INTRODUCTION**

Information Technology and Robotics Technology are responsible for making impossible to possible and unachievable to achievable. Digital transformation is taking place very fast in a digital communication environment. Portable digital devices are transforming and reshaping the entire paradigm of information preservation, communication, and dissemination. Prof. S. R. Ranganathan firmly advocates saving the time of user in the fourth law of the Library science. If we keep in mind this law to serve information seekers and information research industry, the libraries have a great opportunity to develop themselves. The ever-growing technology plays an instrumental role in reaching to the right user at the right time. Searching and researching of information from trillions of databases and data houses are quite difficult and time consuming even though it all available on the digital environment. The invention of search engines are the key revolutions to make things easy to the researchers in finding,

discovering and search for information from the complex preserved data servers. The search strategies, information coverage, and technology are some very important factors in the whole process of information collection, preservation and dissemination.

The Catalogue cards, Bibliographies, Directories are some of the systems used to search desired bibliographical information. They are very relevant too, but with the advent of the Internet era, the information is passing through a very fast system of packaging and repackaging of information, where information searching is a great challenge too. Every search engine facilitator is trying to make the system easy for the customers irrespective of the understanding of the customer towards information search. The search box of the search engines was made for typing text and typewriter friendly. Maximum languages are being covered to search for information in the search engine platform. There was a limitation also. In search engines, the user has to type something to get the desired information. The interference of portable devices like smartphones forced to think on some alternative technology or method to search the information over the search box of the search engine without using typewriter or mouse device or any other pointer device. The challenge was accepted and voice search technology was developed. Google Inc. was the first one to incorporate it in its search engine GOOGLE and named it 'Ok Google'. The popularity of voice search may be appreciated with the fact that almost 34% of the global Internet population is interested in voice-assisted services (McCue,

2018). Voice technology is going to boost voice commerce which is operating in various projects like voice assistance, voice search and voice-enabled devices.

## LITERATURE REVIEW

Johan Schalkwyk did a survey with a sample of 1.3 million queries in summer 2009 to analyze the use of voice search technology and typing technology (Schalkwyk et al., n.d.). The authors found that 34.6% users made queries through the spoken environment. They also emphasized that cloud computing is one of the factors for the success of mobile technology. Catherine Park also added comments of Richard Dean in a paper, "Voice search is still growing and there is not enough data or research around yet to understand the full impact. But there are a few known parameters that SEO experts can analyze to effectively understand the impact of voice search on SEO and make the right adjustments" (Park, 2018). In 2017, Mindshare did a study entitled "A consumer trends and insight report on voice technology and its impact on brands" and found that 60% of smartphone users were in favour of using voice search technology for all such activities if it will respond like a human speech (Voice Today, 2018). Rebecca mentioned the statement of Brent Csutoras on the future of voice optimization that "This is an important technology I really think you should pay attention to. What I worry about is that people start feeling like they have to be involved, right? It's like, Oh crap, I don't want to be left behind (Sentance, 2018)." According to Think Tank Webinar (Baker, 2018), the 'OK Google' based assistance is 95% accurate in understanding the English language which is

really a higher rate of accuracy. They also mentioned that several universities worldwide are testing 'Echo Dots' which will assist to students for getting alerts on class schedule and tuition fee payment etc. The study is quite encouraging that voice search technology is now being used by various stakeholders where the search for information is involved. Universities also started such projects to facilitate their students in more easy way. In a study at Kurukshetra University Library it was observed that for optimum use of OPAC, touch screen enabled OPAC Kiosk may be used along with awareness programme (Kumar, 2017). A study on effective use of OPAC reflected that "Librarians must continue to play the role of an 'Agents of Change in the use of online catalogues'(Mulla & Chandrashekara, 2009). Voice Report 2019 found in a survey that 72% people are using voice search facility to get digital personal assistant (Bingads, 2019). In a market research based study it was stated that "In doing so, VAs may assume a central relational role in the consumer market and progressively mediate market interactions"(Mari, 2019). In this view, we can see that library professionals are using technologies to make optimum use of OPAC. In present environment, the voice search is hugely accepted by digital users in their day-to-day assistance. Therefore, the libraries have every possible chance and opportunity to use speech or voice search technology in its Web-OPAC services.

### **OBJECTIVES OF THE STUDY**

1. To briefly study the historical background of the development of Voice search technology;
2. To summarize the available speech recognition or voice technology;
3. To provide an overview of how the voice searching has been used by various companies; and
4. To suggest how the voice search enabled OPAC may make the searching more effective.

### **METHODOLOGY**

The methodology used in this study is Literature review. The authors have tried to study how the voice technology is facilitating the searching. A detailed review of the related literature was made how speech technology can be incorporated in the OPAC to help the readers to retrieve the desired information more efficiently and effectively from the library.

### **BACKGROUND**

The voice technology is not new. It was used by the software and programming professionals for various purposes in early 1960 too. IBM launched 'IBM SHOEBOX' in 1961 which was capable of recognizing 16 digits and words. It was assumed to be the first used speech recognition technology. The research and development were carried out by the computer experts and innovators to enhance its capability. Sixteen words recognition was not sufficient and it was not helpful to the users too. It took almost 10 years to launch another speech recognition tool- 'HARPY'. It was introduced by Carnegie Mellon in 1972 which was capable of understanding 1000 words which were quite a large number than 'IBM SHOEBOX'. Texas Instruments announced

‘Speak & Spell’ services in 1978, where the consumer may speak and that could be written. An American Company named Dragon Naturally Speaking presented a product for consumers for speech recognition facility in 1990. The product was ‘Dragon Dictate’ which was available at the price of \$6000.00. It was a very expensive product too and not feasible for everyone. The high price of the product was one of the reasons, it didn’t gain much popularity.

IBM first launch speech recognition device in 1961 and it kept investing in research and development in his ‘IBM Shoebox’ product. In 1994, the company made a serious effort and launched one more product with the name – ‘IBM ViaVoice’. It was capable of recognizing continuous unlimited words and digits. A free version of ViaVoice was also made available to the general public in 1999. One of the leading software companies Microsoft made available speech tools with its Windows 95 Operating System in 1995. The Speech tools were used to get assistance services in operating with Windows 95 environment.

The era of the 1990s was quite remarkable for speech recognition technology. Many software development units started incorporating the technology in their software programs. In 1995, SRI adjusted with the first ever interactive voice response software. Microsoft released Windows-XP and Office with SPEECH program using SAPI 5.0 technology where speech recognition was active with MS-Office application software.

Perhaps Microsoft was the first one who introduced Mobile Voice Search facility in 2007 for its search engine ‘Bing’ which was known as Live Search. In 2008, Google Inc added Voice search facility for Google App for iOS smartphones. Apple Company jumped into voice recognition or speech recognition software market with a speech recognition tool for Apple iOS smartphones which was known as ‘SIRI’. Google started the ‘Google Now’ facility in 2012, whereas, Microsoft started ‘Cortana’ assistant services for all versions of Windows operating systems in 2013 (Luciano, 2018).

The online marketing companies were earlier using Google and Microsoft’s speech recognition tools for searching products on their marketing online portals. In 2014, Amazon launched ‘Alexa’ and ‘Echo’ speech search facility for its prime members. The competition among various software development and online marketing agencies is increasing day by day. They are meticulously planning every day to surprise their customers with additional new features. ‘Google Home’ and ‘Google Assistance’ were other tools introduced by Google in 2016. In the same year, a well-established Chinese manufacturing company launched ‘DingDong’ in response to Amazon’s Echo facility. ‘Hound’ was a virtual assistance application software and was released by SoundHound in 2016 too. It was powered with voice technology. Year 2017 was another remarkable year in the development of new voice technology-enabled services and tools. One of the largest smartphones manufactures Samsung added ‘Bixby’ app for its customers. Apple launched ‘Homepad’ feature for Apple

smartphones. The Alibaba online shopping company launched 'GenieX1' smart speakers which were programmed to work on voice commands. Amazon upgraded 'Amazon Echo' and now it is used for sending messages and making calls. The Google CEO, Sunder Pichai introduced 'Google Duplex' technology in 2018 which is the combination of Google Speech and AI (Artificial Intelligence) technology. It is used for booking seats in the restaurants automatically. Presently it is used in the USA. It is considered that the Search Engine of Library collection is OPAC. The voice recognition technology may be used to address a large number of users and libraries to attract and facilitate the library services to the next level.

## TECHNOLOGY DISCUSSION

Search and research under search engines and other platforms are actually the replica of the information management and retrieval system. Speech recognition or voice technology is the result of consistent progress in AI technology. AI

and robotics technology are getting more attractions day by day. The user-friendly devices are the reason for the acceptability of innovative technologies among the customers. It is the combination of machine learning and sophisticated algorithms (Luciano, 2018). The human audio is the analog signal which is been converted to the digital signals and forward it for the pattern recognition. The algorithms work here and resulting voice/speech terms into text.

It uses the following steps-

- i. Activate the voice recognition tool of the system or virtual assistance of the computer device.
- ii. Every search engine has its own nomenclature to use the voice search facility. e.g. Google uses 'Ok Google'; Apple uses 'Hey Siri'; Amazon uses 'Hey Alexa' and so on.
- iii. After getting the voice command from such platforms, it transforms human speech to text.

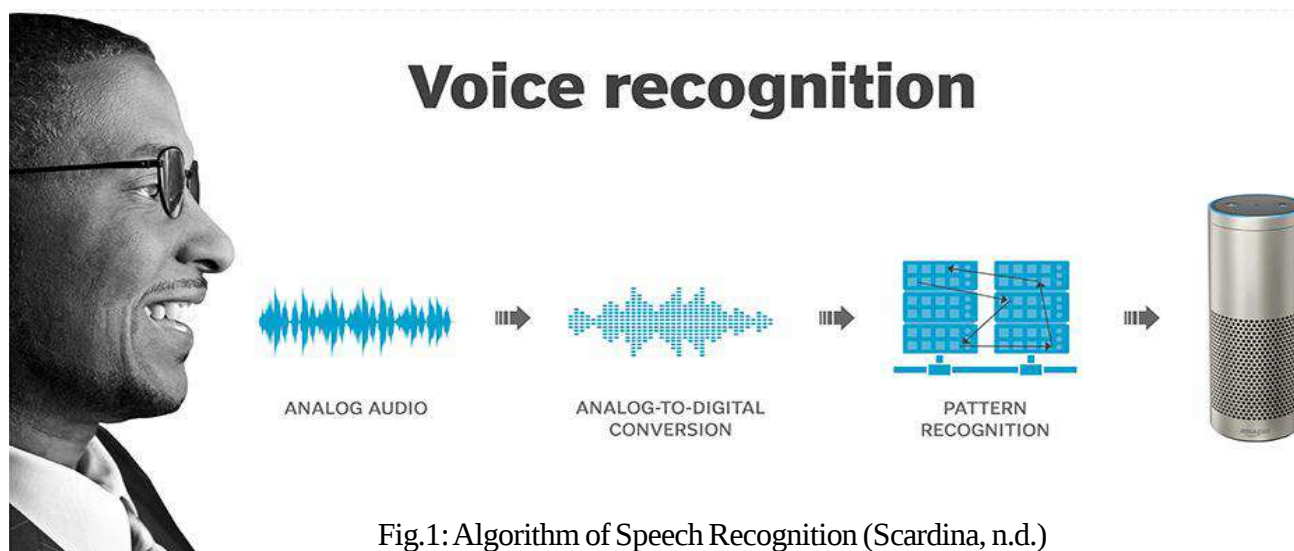


Fig.1: Algorithm of Speech Recognition (Scardina, n.d.)

- iv. This converted text and commands used to search by the search engines in available resources.

The search results are presented in the digital, text or multimedia formats to the researchers.

### **USE OF SPEECH RECOGNITION TECHNOLOGY IN WEB-OPAC**

The library is the place to enjoy research documents and reading materials. Doubts and Libraries are good friends. They always help the researcher in reaching to the solutions of a problem. Modern Libraries are loaded with a variety of resources. The collection is available in print and digital versions. The basic challenge among the users is to find the right information at the right place and at the right time. User needs to search not only bibliographical database of the collection but also the digital one also. Online Public Access Catalogue (OPAC) is the panacea of such problems. Web-OPAC is another level to facilitate access to its collection over the Internet environment. In fact, it's a single window facility to all available services in the library. The ALA GLOSSARY explains OPAC (Levine-Clark & Carter, 2013) -"A computer-based and supported library catalog (bibliographic database) designed to be accessed via terminal so that library users may directly effectively search for retrieve bibliographic records without the assistance of a human intermediary such as a specially trained member of the library staff". The OPAC has been transformed a lot with the facilities and the coverage of the data as well. Initially, it was providing merely an alphabetical list of

documents available in the library and were accessible to stand-alone systems only. OPACs were not so user-friendly that the user may use them alone. But, technology updation has removed all such big bugs and restored the real usability of OPAC. Now web-based OPACs are available on the web. It was used by the various universities in the USA initially in the seventies. Over time they accepted by the library and information science professionals all around the world. In India, OPACs are integrated as one of the features of Library Management Software Systems package.

The modern day Library Management Software is integrating Web-OPAC by which the collection may be searched under various search fields. Keyword search and Boolean search are quite common in OPAC. The search queries may only be made through typewriter by typing desired keywords in the search box of the OPAC. All possible search links and fields are available within the OPAC system. The user may access to information with any of the keyword or combination of keywords with multiple search fields or any specific search field like author, title, page number, year, publisher, publishing place, subject areas etc. Such flexibility is the key to success of OPAC. It has certain limitations too. A library user needs to possess the basic skills to handle a computer keyboard, which may be a problem for some of the people who lack basic computer skills. Another problem with the OPACs is that they only give the results of the exact match keyword. If a library user makes a spelling mistake, the OPAC will not show the list of probable words and return with no results. A library

user must “possess a minimum grasp of the English language, more exactly the ability to remember and enter the correct spelling of the phrases being sought”(Jeevitha & Kavitha, 2018).

The modern generations are quite familiar with computing and smart devices. They are using it probably since their early childhood. They want to use each feature of the device. The library users are expecting the same facility for the library. They are looking forward to app-based OPAC system rather than standalone software or website based search system. They often compare the library search platform to Google or Bing search engine’s platform. OPAC with voice has been used in several big libraries in Indonesia. One of them is in State Islamic University of Sunan Kalijogo (Irfana, 2018). The innovators and library professionals may think to use speech recognition or voice search technology alike ‘OK Google’, ‘Hey SIRI’ and ‘Hey Alexa’ in Library Management Software. Irfana and her team

suggested that with voice-enabled OPAC library visitors will find it faster and easier to find books that they need Integration with Google is needed to convert the voice into text (Irfana et al., 2017). Through this, searching will be fun. The Web-OPAC may be more popular among the users. Users may search and find their documents while they are walking, driving or moving somewhere.

For Library and Management Software, it is going to be a challenge to incorporate voice search technology along with Web-OPAC. Senayan Library Management System (SLiMS) which is open source LMS and developed by Indonesian Library Community in 2007 has integrated Google voice search in OPAC using Google Chrome browser in SENAYAN - 7 (Cendana) released November 21, 2013 (FOSS4LIB, n.d.). Library software developers may either integrate ‘OK Google’/‘Hey Alexa’, etc. with LMS or they may develop to their own only for the libraries.



Fig:2 Senayan Library Management System (SLiMS) OPAC (FOSS4LIB, n.d.)

The Indonesian libraries have started Voice Search facility within OPAC services in 2013. It may be seen from the figure 2 that microphone icon is available in the OPAC search box of Senayan Library Management System (SLiMS) Open Source Library management software. In India, KOHA and LIBSYS are widely used Library Management System to automate housekeeping activities of the library. As KOHA is an open

source software, whereas, LIBSYS is proprietary software but both are missing with microphone icon and voice search facility in their OPAC portals. SOUL (Software for University Libraries) is also extensively used by the Indian universities and colleges. It is developed and distributed by INFLIBNET, Government of India. The voice search facility is not also been incorporated by SOUL too.

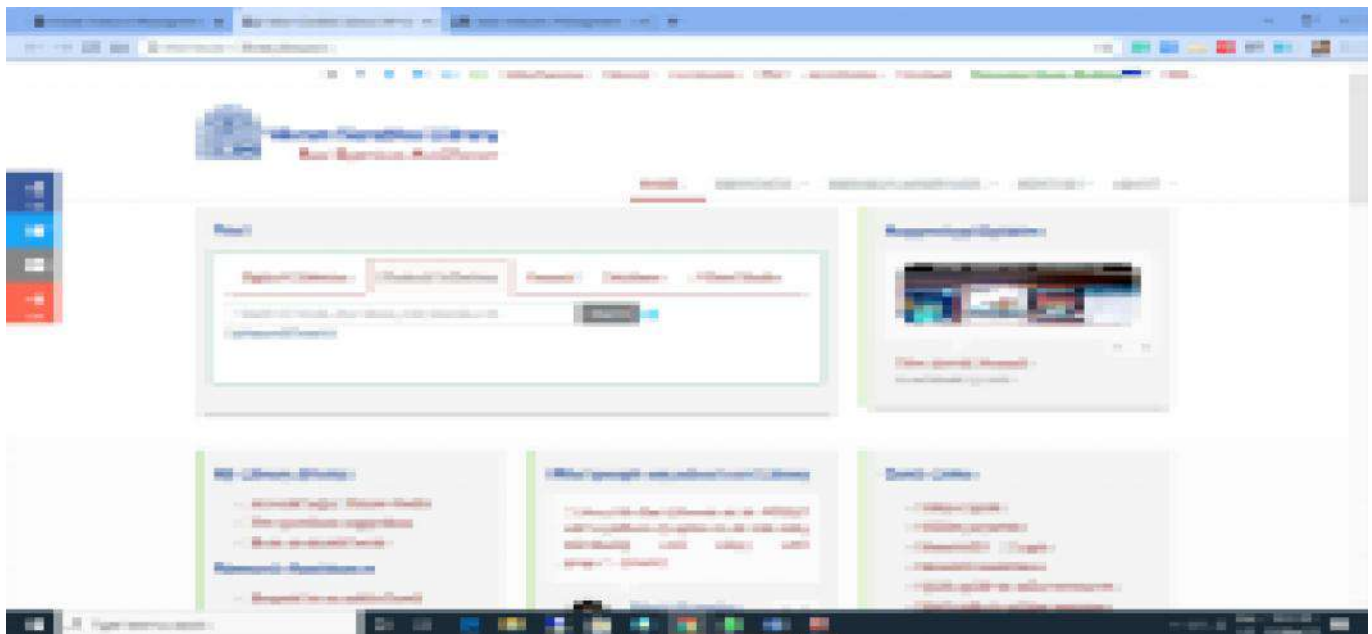


Fig.3: KOHA OPAC@IIM Ahmedabad Library (Indian Institute of Management Ahmedabad Catalog, 2019)

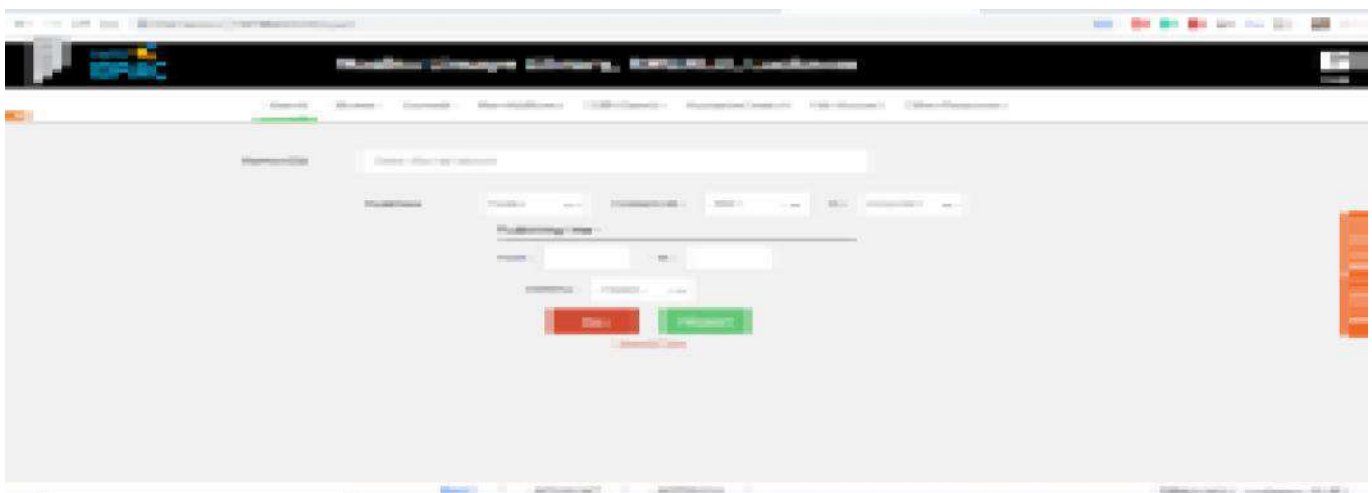


Fig.4: Libsys7 OPAC@RMLNLU

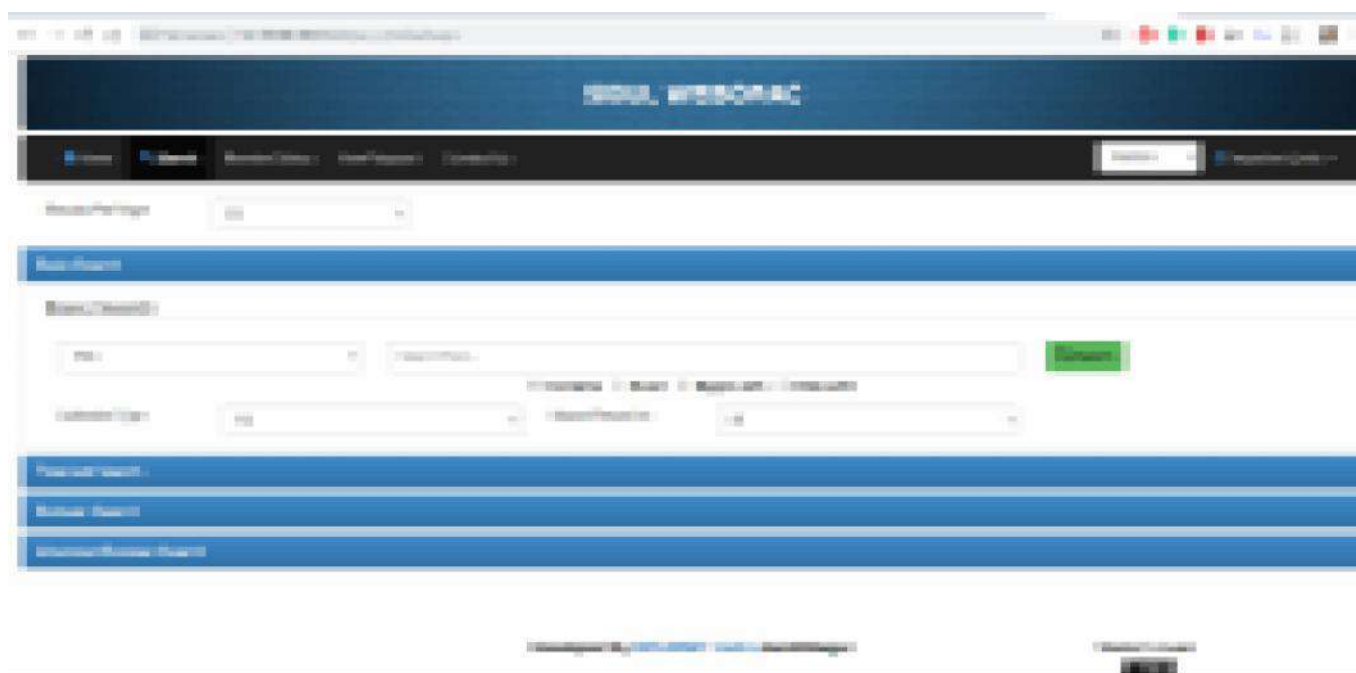


Fig.5 SOUL OPAC@INFLIBNET Library, Gandhinagar (INFLIBNET, 2019)

The LMS is now receiving a lot of challenges from the information search market. The marketing companies like Amazon and JBL are developing their products which are compatible with speech recognition technology. Such products are capable of performing music and enabling people to shop their desired products. Libraries are one of the premier stakeholders who are working for information collection, preservation and retrieval. Therefore, Libraries should work with software developers to surprise their users with voice search facility. This could be emerging factors in getting the popularity and usage of web-OPAC and its resources. The 'Talking OPAC' service may be used with the tag line 'Hello Library' or 'Hello User'.

### BENEFITS

Each technology has its own set of essence which is been appreciated by its users. If we

analyze the benefits of speech recognition technology, then we find that

- It is faster than any other medium of search such as typing search. In this way, it is user-friendly and saving the time of the user. It also serves the fourth law of library science i.e. save the time of the user.
- Communication and AI technology are passing through the highway of innovations. Apps based software system is now the fashion for each computing device. It may be proven to be the smart search for apps.
- Voice search is not only capable of doing a search within the text but it also able to get images and video search.
- The Web-OPAC and other library collection may be used during the driving and other work where the user does not have time to settle with typing devices.

Voice search is user-friendly, simple and compatible with every user. It could be more like a boon for disabled people, especially to visually impaired people.

## CONCLUSION

Keeping in view the use and popularity of smart-phones and smart devices, Libraries are developing the search gateway of their collection on the app-based system. The apps of the library and web-OPAC are now made available by various commercial LMS companies to serve the patrons of the library in a more user-friendly and portable accessible medium. Libraries should implement voice-enabled OPAC for input and output of library search. Voice search technology or speech recognition-based technology alike 'OK Google' and 'Hey Alexa' may be used in Web-OPAC which is going to be a challenge and useful for the young and smartphone savvy generation. The market of search technology is transforming from text to voice. The libraries should adapt to accept the challenge of the market as well as to facilitate its users at the next level. Libraries are expecting to welcome 'Hello User' or Hello Library' voice search facility within OPAC very soon.

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