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Information and Communication Technology (ICT) and libraries: Research mapping and scientometric overview with special reference to Indian research

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Abstract

Application of Information and Communication Technology (ICT) is of paramount importance in modern-day libraries and information centres. ICT helps in capturing, processing, storing, and communicating information. No library can still rely only on traditional printed information resources to perform effectively and efficiently (Etebu, 2010). The present study investigated the various realms of research pursued focusing on ICT with respect to libraries and made an effort to map the research scientometrically with a special reference to India. ICT and library related SCOPUS records are elicited and analysed to make a review of the research pursued by professionals in the field. A steady growth in the number of publications in the area and an increasing trend is observed during the last ten years. Most of the studies are surveys in nature conducted in libraries attached to academic institutions. ICT and its implementation, usage, skills acquired by professionals, ICT development, accessibility, its impact on individual, institution, society, evaluation are the key areas discussed in most of the publication records. There are some research areas identified by the present study to be explored by researchers world-wide and Indian researchers. Special libraries and public libraries are to be focused as the users of the libraries are multifaceted. *Library Philosophy and Practice* is the most preferred journal for publishing research outputs from researchers in the field and Egypt and India have the maximum number of authorships in the published papers. The comparison of ICT research areas at global level and Indian scenario enabled to identify the gaps in research at both level so that those indents to take up new researches may choose the areas on complementary way.

Keywords - ICT; Information and Communication Technology; Libraries; LIS Professionals; ICT Infrastructure; ICT Acceptability; Scientometric analysis; Research mapping; India

1. Introduction

The American Library Association (1983) defined information technology (IT) as the "application of computers and other technologies to the acquisition, organization, storage, retrieval, and dissemination of information". From the evolution point of view it can be stated that Information Technology (IT) has extended to Information and Communications Technology (ICT) integrating communication technologies and computers, as well as necessary enterprise software, middleware, storage, and audiovisual systems, that enable users to access, store, transmit, and manipulate information. Information technology and information and communication technologies are used somewhat interchangeably (Saleem, Tabusum & Batcha, 2013). With the fast advancements in digital emergence of computer technologies, telecommunication technologies, and other media technologies (communication), ICT has become a subject of interest to many researchers (Walmiki & Ramakrishnegowda, 2009). Ebijuwa & ToAnyakoha (2005) defined, ICT as "tools and as well as means used for collection, capture, process, storage, transmission, and dissemination of information".

In the revolutionary path of ICT, information collection, processing, storage, communication, dissemination of information, automation, the Internet and development of the World Wide Web etc are come on the way (John & Balasubramanian, 2019). Worldwide libraries have undergone a significant metamorphosis – from a purely traditional manual service delivery system to a more dynamic technologically driven system for the last two decades (Akintunde, 2004). New communication technology is giving shape to librarianship and libraries, the new librarianship is also shaping the architecture and designs of information and telecommunications technology. The transition from simple information technology to modern information and communication technologies made an unprecedented impact on libraries (Siddike et al., 2011). Nowadays. to achieve institutional goals, ICT is very significant for accessing information from the globe, information processing, and providing effective information services (Tiwari & Sahoo, 2013). Hence, with ICT, almost all functions of libraries are now practicable with a higher degree of user satisfaction (Ajayi, 2002; Abels et at., 1996). Haneefa (2007) has stated that the effective application of ICT in libraries helps in performing their operations and services most efficiently. A great amount of resources and time has been invested in ICT in developing countries (Gould & Gomez, 2010).

There are a lot of studies on different realms of ICT conducted by LIS (Library & Information Science) professionals mostly of survey type. The present study attempts to analyze a few studies included in the SCOPUS database and map the research areas to identify the knowledge and ideas that have already been established on ICT, including their strengths and weaknesses. The study also makes an effort to correlate the world scenario with Indian research on the topic so that some of the gaps in ICT research may be explored.

2. Objectives

The aim of the present work is to have a discussion on the research areas related to Information and Communication Technologies (ICT) and libraries and arrive at some concensus about the areas where international community have worked in comparison with India along with some scientometric inferences. The specific objectives of the study are:

- Present the chronology of the ICT research related to libraries
- Identify the environments where library related ICT surveys are performed
- Identify the core areas of research
- Compare the micro research areas where international community has worked in and Indian researchers have not touched upon and vice versa
- Idenify the journals preferred by researchers in the field to publish their research outputs
- Map the countries occurred in the affiliations of the authors

3. Materials and Methods

The keywords 'ICT' and 'Information and Communications Technology' are used to retrieve published records on ICT from the SCOPUS database operated by Elsevier publishers. The records are then refined using the keyword 'library' in the title field to get ICT studies related to libraries. The period was not restricted to the study. The records are further analyzed by MS-Excel spreadsheet application and one count weights are given for one occurrence of the parameters under study.

4. Findings and Discussion

4.1 Chronology of research

As observed in the SCOPUS database, there are a total of 183 records related to ICT and out of these records 40 (22%) records are India based studies. The 183 records include 161 journal articles, 9 books/book chapters, and 13 popular conference papers. The chronology of the publications as presented in Figure 1 shows that there is an average of eight publications in a year starting from 1999 onwards and a maximum of 29 in the year 2019. An upsurge trend in the number of publications can be observed after the year 2010 onwards. The research has started only from the year 1999 as it is believed that the initial stages of ICT implementation in libraries are faced in locating online access to electronic resources, digital information services, and of course manpower development (Elisha, 2006).

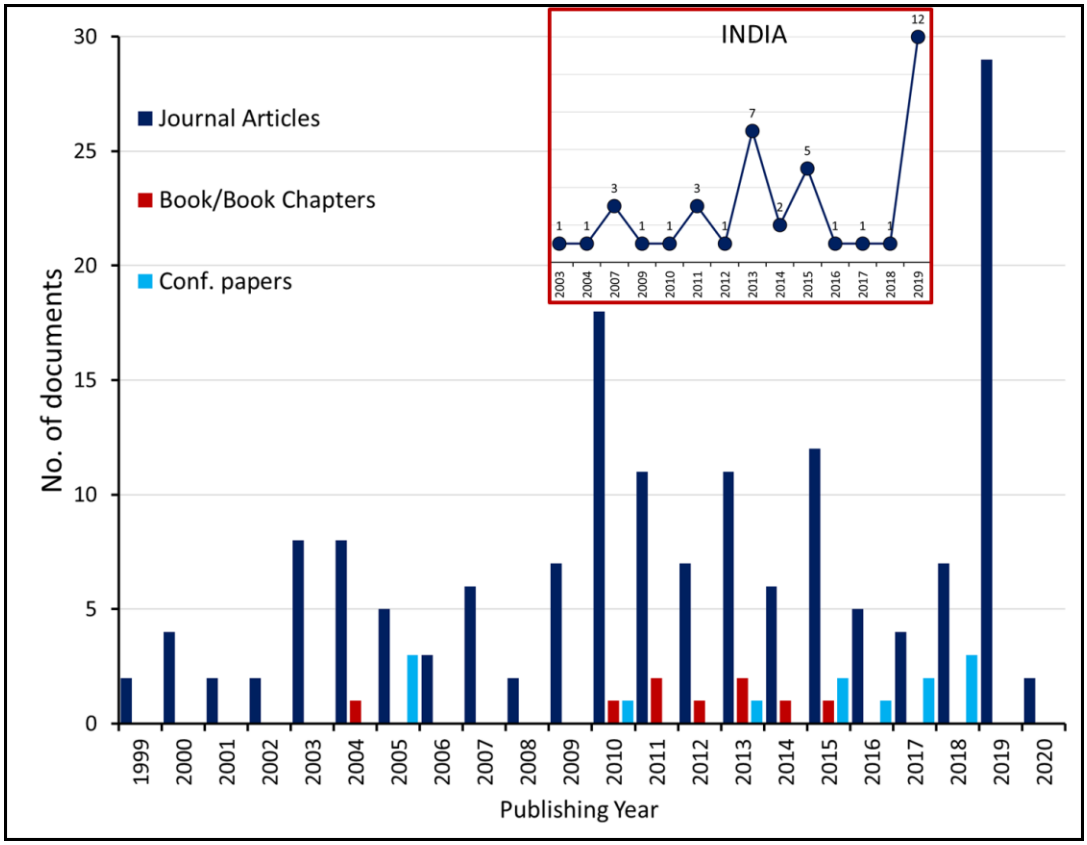

Figure 1. Chronology of publications related to ICT and libraries (India's trend in inset) as per SCOPUS database

4.2 Surveys observed

The present work has gone through the abstracts, titles, and keywords of the records which are indicative of what is being studied or what is being communicated. A maximum number of studies are survey-based and most of the surveys are conducted in University setups. The overall picture of the surveys conducted in different library levels is presented in Figure 2 (The academic libraries include only school and college libraries). The sector for special libraries in Figure 2 covers a wide spectrum of different types of libraries whereas in the Indian environment the sector discusses few medical libraries and a library attached to a research organization. Indian researchers and professionals in the field may be able to explore new surveys extending the libraries of similar nature. For example, jail libraries are not covered in the list of special libraries.

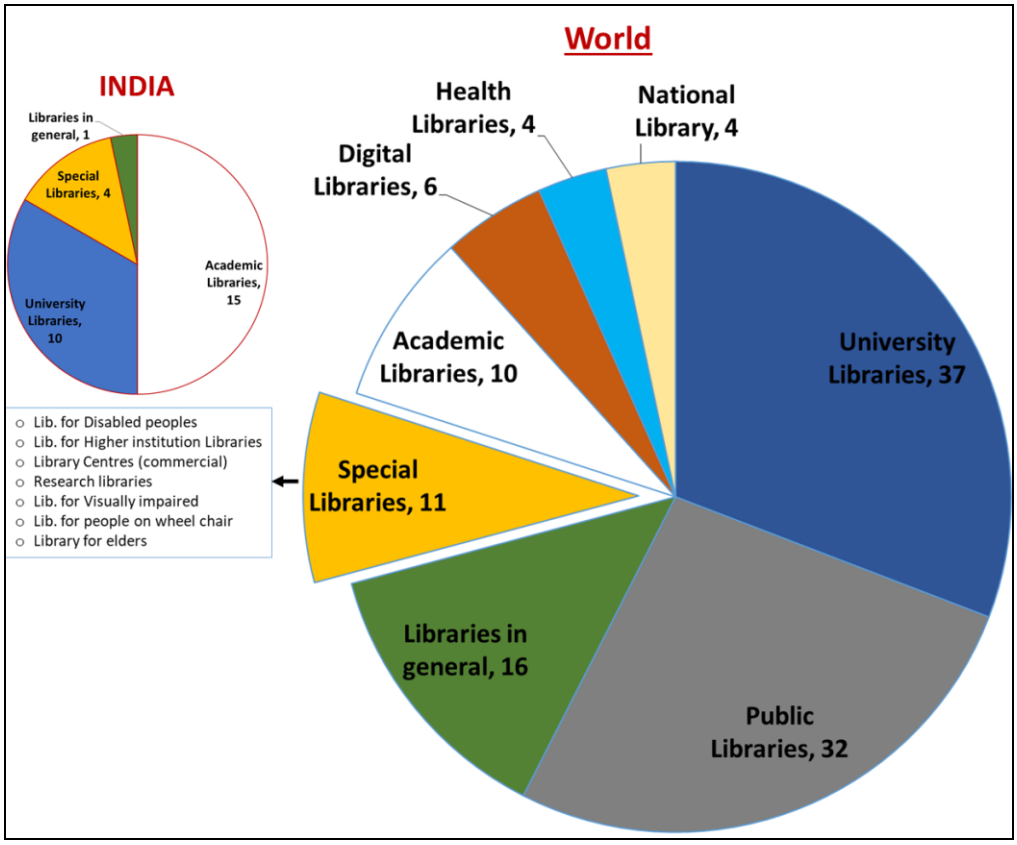

Figure 2. Break up of libraries where surveys on ICT and libraries are taken place as per SCOPUS database ((India's break-up is given in inset)

It is observed from the records that finance, planning, management support, IT trained staff, the willingness of staff, consultancy service for ICT, the well-accepted standard of LMS, less expensive standard software, hardware, training facility, time, awareness, frequent changes in IT are some of the factors affecting the proper implementation in libraries.

4.3 Areas of research

ICT has provided facilities that are leading to the individual (economic, social, political, cultural) development or institutional growth and harness at a global scale (Adeyoyin, 2006). Many of the studies are discussing the infrastructural and implementation aspects of ICT. Abstracts, titles, and keywords are analyzed, to sum up, different realms of ICT and it is found that the majority of the research is carried out around the following concepts:

- ICT implementation
- ICT usage
- ICT skills
- ICT development
- ICT accessibility
- ICT impact

– Evaluation of ICT

There are some studies focused on ICT application to certain specific areas of LIS in Table I.

Table 1. ICT application to certain specific areas of LIS

ICT for	Collection development
	Classification and cataloging
	Library cooperation
	Circulation
	Information delivery
	LIS teaching
	SDI & CAS
	Overall library management
	Promoting Reading
	Reference service
	Security and theft protection
	Information retrieval
	Library networking
	Serials management

The user community in libraries is always expecting information services directly or remotely and in real-time, format notwithstanding (Anunobi & Edoka, 2010) and ICT based library services almost satisfying users with self-service and simultaneous access to resources (Womboh & Abba, 2008). There are a lot of user-centered surveys discussing expectations, the current scenario, satisfaction, and future requirements of users.

A close review of the publications enabled us to make a table (Table II) where the broad areas of research of common interest to the world and India are listed with several publications. Some of the areas covered are not touched upon by Indian researchers. However, some unique areas pursued by Indian researchers are not done by researchers from other countries.

Table 2. Broad areas of ICT research and number of publications as per SCOPUS database

Subject	**No. of papers**	
	World	**India**
Training, skill development of professionals	28	10
Institutional & societal impact	20	7
ICT Application status	18	4

ICT effectiveness evaluation	8	2
ICT accessibility	7	4
Impact on LIS students & teachers	6	0
ICT Curriculum & Syllabus	5	1
Digital divide and reach of ICT to society	4	0
ICT infrastructure & Facilities	4	3
ICT & Customer relationships	3	2
ICT & Developing countries	2	0
ICT policies	2	1
Socio-economic factors & ICT	2	0
LIS professionals (beginners & semi-professionals)	2	1
Cost effectiveness	1	2
ICT Acceptability	1	1
ICT & security and theft prevention	1	0
ICT use & gender difference	0	1
Job satisfaction	0	1
Other aspects	29	0
Total	**143**	**40**

4.4 Published Journals and affiliated countries of authors

It may be interesting to know which are the journals preferred by LIS researchers who are focused on ICT. The journals used for publishing are listed in Table III with the number of publications from the world as well as from India. Most of the journals in which ICT and library-related research outputs are published have a slant towards journals with the scope of information technology or electronic library.

The study has analyzed the affiliation of authors who contributed to the knowledge base in ICT and libraries. Nigeria has occurred in affiliations of authors maximum number of times (87 times) followed by India (74 times); United Kingdom (23 times); United States (20 times); South Africa (13 times); Bangladesh (12 times); Brazil (11 times).

Table 3. Journals preferred for publishing ICT & libraries related articles by ICT researchers with some articles published as per SCOPUS database

Journal	**No. of articles**	
	World (incl. India's)	**India**
Library Philosophy and Practice	65	21
Program: electronic library and information systems	12	4
DESIDOC Journal of Library and Inform. Technology	6	4
Electronic Library	6	1
International Information and Library Review	6	2
Library Review	6	2

Information Development	5	0
Education for Information	3	0
Revista Interamericana de Bibliotecologia	3	0
Annals of Library and Information Studies	2	1
Evidence Based Library and Information Practice	2	0
IFLA Journal	2	0
Indian Journal of Science and Technology	2	2
Journal of Librarianship and Information Science	2	0
Lecture Notes in Computer Science	2	0
Library Hi Tech	4	0
The Electronic Library	2	0
Other journals	31	2
Total	**161**	**39**

5. Conclusion

The approach by authorities, library professionals, and users of libraries are always appropriate choices for research because there is a direct relationship with real ICT and the changing IT concepts (Spacey, Goulding & Murray, 2003). Library professionals are accepting the changes in ICT happily along with their routine works for many years and the other reason may be the fear of being left behind, or replaced by others who have the relevant technical skills. The research in the field has steady growth and there is a surge in recent times. Research has been conducted from different angles to ICT and libraries. There are other areas which are needed to be explored by researchers world-wide and Indian researchers. Special libraries may be the focus of research in the area. The access and usability of ICT technologies should be given at most care when ICT is being implemented in public libraries because the urban communities depend mainly on services of public libraries and the nature of users are multi-faceted (Phipps, 2000). Emerging ICTs in India have changed traditional libraries into knowledge centres and librarians function more like consulting information engineers or knowledge managers (Sampath Kumar & Biradar, 2010). However, the situation in college libraries in India is different and many are not in a position to fulfill their objectives reasons for which include: lack of a good library policy; high rate of unplanned growth; irrelevant collections; poor organization of materials; high cost of collection and storage; unqualified staff; inefficient retrieval systems; diversion or unscientific use of funds; and lack of support from the management side.

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