University Librarians Association
ULA Sri Lanka

2022 iCULA
International Conference of University Librarians Association

Connecting People through Transformative Libraries

PROCEEDINGS of the 12th INTERNATIONAL CONFERENCE 2022

University Librarians Association of Sri Lanka
in Collaboration with the
Standing Committee on Libraries and Information Sciences
of the
University Grants Commission, Sri Lanka

Colombo, Sri Lanka
27th October 2022

PROCEEDINGS

12th International Conference of the University Librarians Association of Sri Lanka

in Collaboration with the Standing Committee on Libraries and Information Sciences (SCOLIS) of the University Grants Commission, Sri Lanka

"Connecting People through Transformative Libraries"

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Hotel Mirage, Colombo

Sri Lanka

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1. **"e-information for Teaching, Research and Learning: Options for a University Consortia"**
   1st International Conference of University Librarians Association (ULA) of Sri Lanka, 27th and 28th May 2005 at Hotel Galadari, Colombo.

2. **"Information Best of Two worlds"**
   2nd International Conference of University Librarians Association (ULA) of Sri Lanka, 23rd and 24th May 2006 at Hotel Galadari, Colombo.

3. **"Libraries in Higher Education: partners in K4D?"**
   3rd International Conference of University Librarians Association (ULA) of Sri Lanka, 8th and 9th June 2007 at Hotel Galadari, Colombo.

4. **"Libraries as Centres of Excellence"**
   4th International Conference of University Librarians Association (ULA) of Sri Lanka, 2nd and 3rd July 2008 at Hotel Galadari, Colombo.

5. **"Research for Impact (R4I)"**
   5th International Conference of University Librarians Association (ULA) of Sri Lanka, 2nd July 2009 at Hotel Galadari, Colombo.

6. **"University Librarianship: An Academic Challenge and an Opportunity"**
   6th International Conference of University Librarians Association (ULA) of Sri Lanka, ICULA 2010, 14th and 15th July 2010 at Ceylon Continental Hotel, Colombo.

7. **"Contribution of the Academic Librarians Towards a Knowledge Society"**
   7th International Conference of University Librarians Association (ULA) of Sri Lanka, ICULA 2011, 16th and 17th August 2011 at Hotel Galadari, Colombo.

8. **"Libraries as Partners of Knowledge Sustainability"**
   8th International Conference of University Librarians Association (ULA) of Sri Lanka, ICULA 2016, 7th and 8th March 2016 at University of Jaffna. Jaffna.

9. **"Academic Libraries as Research Saturation Centers: Reshaping the Libraries for Tomorrow"**

   9th International Conference of University Librarians Association (ULA) of Sri Lanka, ICULA 2018, 20th and 21st September 2018 at Golden Rose Hotel, Boralesgamuwa.

10. **"Reinvigorating Libraries: Smart Responsiveness for Sustainability"**
    10thInternational Conference of University Librarians Association (ULA) of Sri Lanka, ICULA 2019, 18th September 2019 at Mount Lavinia Hotel, Colombo.

11. **"Scholarly Publishing & Open Access for the Enhancement of Research Visibility"**
    11thInternational Conference of University Librarians Association (ULA) of Sri Lanka, ICULA 2021, 22nd September 2021, Virtual Conference.

MESSAGE FROM THE CHIEF GUEST

SENIOR PROFESSOR PREMAKUMARA DE SILVA
Chairman, SCOLIS
University Grants Commission
Sri Lanka

It is a pleasure to send a message to the International Conference on "Connecting People through Transformative Libraries" organised by the University Librarians Association of Sri Lanka. This conference would facilitate the space to discuss the critical aspect of transformative libraries.

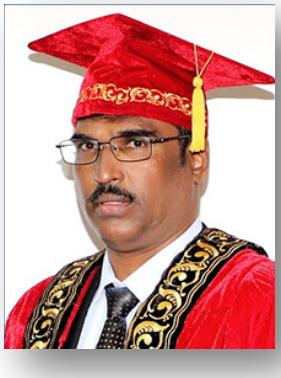
As a starting point, since last year, we have taken the initiative to formulate policies to practically bed in new libraries and information services at the UGC level; now, we need to take a closer look at the recent developments in libraries. The Standing Committee on Libraries and Information Sciences (SCOLIS) has already laid the groundwork for building transformative libraries in higher education; however, we must explore further opportunities to do more.

I look forward to the opportunity to hear global speakers and local researchers describe how the library sector can connect people by responding more effectively to the changes and modifications brought about by digital technologies. This enables our libraries to continue to be learning and communication hubs and connected citizen hubs to build a set of networked citizens of Sri Lanka. The theme of the conference also paints a wonderful vision of a content-rich national digital platform. We need to make libraries accessible in a way that directly relates to citizens' issues and their personal productivity. We, as administrators, policymakers, regulators, users and librarians, and standard setters, have a part to play. Hence, let us all do our part to ensure they are used to this.

I take this opportunity to congratulate the Conference organizing panel of the University Librarians Association of Sri Lanka for their vision and passion in organizing such a remarkable conference.

Senior Professor Premakumara de Silva
Chairman
Standing Committee on Libraries & Information Sciences
University Grants Commission
Sri Lanka

MESSAGE FROM THE GUEST OF HONOUR



PROFESSOR V. KANAGASINGAM

Vice Chancellor

Eastern University, Sri Lanka

It is very proud to express that a transformation happens in a conducive environment where the teaching and learning process of education is back on the track. An International Conference which is intensively engage in attitudinal change, shows that everything is in association with the thought process where an individual reluctant to express matured ideas in this contemporary societal events. These transformative libraries will intensively connect the people of creativity and innovation and bring in the door stem buy-ins and transformed minds will work together for outcomes.

When we consider Scientometrics, Informetric, Webometrics and Bibliometrics in this transformative process, there we concentrate Digital Citizenship in which personal responsibility highly expected in accessing technology for the benefit of their community day today basis. Connecting people and resources, definitely educate themselves, and create lasting relationships, which is itself a transformative process.

Innovative practices in library sector as one of the themes here is appropriately pitched. Silence is the icon of libraries till the transformation comes in while books kept as preserves of knowledge and practices in the past centuries. But thanks to the technological revolution where libraries today filled not only with beautiful and resourceful books but also with interactive tools and spaces, from multipurpose open environment to recording theaters and workshop rooms to develop reading as a skill. While braining towards transformation we do restructure our libraries to suit the students and academics where a unique architecture designs of innovation spaces to enthuse readers to interact with others and mutually explore the strengths and opportunities and even creative skills to turn the libraries into a social sphere which resembles silence as an option. Transformative libraries are inventive institutions that fortify minds, disseminate knowledge among the people and stood-up into the cloud and in the cloud as virtual as the learning hub for future generation.

Professor V. Kanagasingam
Vice Chancellor
Eastern University, Sri Lanka

MESSAGE FROM THE PRESIDENT

DR. W. J. JEYARAJ

President, ULA

Librarian, Eastern University, Sri Lanka

First of all, it is with great pleasure that I pen this message in coherence with this memorable academic event. It's been a daunting transformation for the library and Information science sector as information was being constantly generated and kept flowing despite all the dilemma taking place on a global scale. Hence, we as library professionals had to find innovative ways to provide access to information working our way around the limitations brought around by the pandemic.

The pandemic dealt new challenges on the table, and we had to face them head on. Librarianship has been trying to keep up with the rate of change in information and communication technologies (ICTs). However, these technologies have been radically changed by the pandemic. Now that the pandemic is over, technological devices and the way we access data using them are now a lot more powerful. We must continue to promote information literacy so that our users are able to take advantage of these resources and learn how to evaluate them critically.

In addition, due to several other factors, libraries have been unable to update their infrastructure with modern computers and their peripherals. Some libraries are still struggling with their old hardware that are not capable to handle the new demand for information. Therefore, this conference aims to draw researchers together to pool their ideas and alternatives to address such issues in the field of library and information science. However, this transformation cannot be done on an individual basis. A group of like-minded researchers, passionate about making information accessible need to brainstorm ideas and have a platform to get together and share thoughts and have an intellectual exchange. Hence, the theme of this conference is "Connecting People through Transformative Libraries".

The main objective of this conference is to address issues in academic libraries in the post-pandemic era. There are various topics that we also look forward to discussing; library vision, library mission statements and their implementation. The library professionals at the institutions need to work towards improving their impact on learning outcomes by identifying domain-specific information literacy standards and working with faculty members to integrate them into existing programs.

Hence, we hope that this Conference gives each and every one of you the platform to meet one another, present your research on a timely topic and ultimately, create a network of fellow researchers passionate about the same field.

Dr. W. J. Jeyaraj
President
University Librarians Association of Sri Lanka
Co-Chair, ICULA 2022

MESSAGE FROM THE CO-CHAIR

DR. C. C. JAYASUNDARA
Co-Chair, ICULA 2022
Librarian, University of Kelaniya

I am pleased to welcome you all to the 12th International Conference on "Connecting people through transformative libraries", organized by the University Librarians Association of Sri Lanka. The conference aims to explore the role of libraries as a tool for connecting people, and its core values include 'creation, discovery, engagement, and exploration'. However, the ability of libraries to engage the community in a country's development agenda has been questioned in recent times. Libraries—and librarians—go beyond their well-earned reputation for providing access to information and helping to build knowledgeable communities. According to sociologist Eric Klinenberg, libraries are not the institutions that most social scientists, policymakers, and community leaders typically bring up when discussing social capital and how to build it. But libraries offer something free for everyone and everything. The day-to-day life in libraries is a democratic experiment, and people sneak into libraries to participate whenever the doors are open, he said. (2018, 35).

Librarians can convene community conversations. Librarians can offer public spaces and programs that bring together people of different generations, classes, and ethnicities. New York City's public librarians run activities supporting everything from Xbox Kinect bowling leagues to karaoke clubs contributing to the city's rich social life. By drawing different segments of the public into a shared space, public libraries often facilitate the creation of social capital. Librarians are a valuable resource for creating healthy, vibrant, and socially engaged communities. Libraries act as bridges connecting people with shared spaces and resources, shared experiences, and common interests. In addition to everyday encounters, library programs create opportunities to talk and work together across their differences. It shows that libraries and their underlying civic infrastructure provide a great way to connect communities. It allows the community to act as co-custodians of shared abundance. Libraries highlight individual community power through the principle that every community member has an equal and inalienable right to participate and share ideas. This allows citizens to breathe life and vitality into public infrastructure and use it to meet their needs. This intangible infrastructure supports a broader network of connections between all types of people and governmental and non-governmental institutions.

It strengthens the sense of "us" and "ours" in communities and positively impacts how we see ourselves and each other. While this contribution is primarily embedded in local communities, a cumulative effect extends to the national level.

Finally, I would like to say that I am delighted to have many leading librarians with us today in various fields. I am confident that the presentations and discussions during this conference will provide us with many insights and solutions to overcome the challenges, which can be used to push forward the talent mobility agenda in all libraries.

Dr. C. C. Jayasundara

Co-Chair, ICULA 2022

MESSAGE FROM THE CO-SECRETARIES

DR. G. D. MANOJA N. SAMARADIWAKARA
Co-Secretary, ICULA 2022
Senior Assistant Librarian
University of Sri Jayewardenepura

DR. MANJULA WIJEWICKRAMA
Co-Secretary, ICULA 2022
Senior Assistant Librarian
Sabaragamuwa University of Sri Lanka

We are honoured and privileged to send this message as the co-secretaries of the International Conference of University Librarians Association of Sri Lanka - 2022 and to welcome all participants attending the conference this year.

Amidst the post-pandemic and economic challenges, the annual international conference is being organized in a hybrid mode. The conference has already been shaped up to be excellent, and the networking opportunities will be outstanding. The programme would indeed be a great success in terms of its quality and the quantity of the submitted manuscripts. Each submitted manuscript received rigorous and professional reviews. We appreciate all the reviewers and editorial committee members for their tireless work in reviewing and editing the manuscripts. The topics of the conference truly reflect the current trends, recent advances, and new approaches in Library and Information Science field. The programme will cover among others: opinion-based studies, human resource management, performance evaluation, information assessment, research collaboration, information-seeking behaviour, and information visualization. The conference offers wide scope for both young and senior researchers to continue their research activities in the Library and Information Science area across the world to present and recognize their achievements.

Organizing and conducting this type of global scholarly event is indeed an immense challenge. Therefore, we take this opportunity to express our appreciation to the organizing committee for accepting this challenge to make this event a reality. More importantly, our sincere thanks extend to the authors of the manuscripts, the keynote speaker, the chief guest, the guest of honour, the conference co-chairs, the technical programme committee, the publication committee, the technical session chairs, the language editors, and all other participants who assisted in this endeavour in numerous ways.

MESSAGE FROM THE PUBLICATIONS SECRETARIES

DR. KALPANA CHANDRASEKAR
Publications Co-Secretary, ICULA 2022
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DR. CHIRANTHI WIJESUNDARA
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Senior Assistant Librarian
University of Colombo

Dr. K. R. N. Harshani
Publications Co-Secretary, ICULA 2022
Senior Lecturer
University of Kelaniya

It is with profound pleasure that, on behalf of the Publication Committee, we would like to offer a word of thanks to our participants, contributors, authors, editors, and anonymous reviewers, who have volunteered to contribute to the success of the 12th International Conference of the University Librarians Association 2022 (ICULA 2022**)** and also to its mission to improve the quality of research in the field of library and information science.

This year's theme of the ICULA is ***"Connecting People through Transformative Libraries"*** and eleven (11) research papers are presented from diverse sub-themes, such as Information Seeking Behaviour, Information Access, Scientometric Studies, Service Quality, etc. The Proceedings comprise the full text of the research papers presented at ICULA 2022. Further, the proceedings of ICULA 2022 are published with a particular focus on quality, safety, and improved outcomes of research and include discoveries, methods, and resources that significantly advance the field of library and information sciences and its applications. We would like to acknowledge all the authors who contributed to enriching this publication.

Our dedicated team strived hard to expedite the publication process while ascertaining a quality blind peer-review process. We wish to extend our sincere thanks to all the reviewers, editors, language editors, and the conference committee for their timely support during the compilation of the ICULA Proceedings 2022.

We hope that you will find the Proceedings of ICULA 2022 informative and enlightening on new developments and advanced techniques in relation to transformative libraries.

Keep reading and keep sharing your thoughts...

MESSAGE FROM THE KEYNOTE SPEAKER

Tracie D. Hall
Executive Director
American Library Association (ALA)
Chicago
United States of America

Greetings from the American Library Association.

It is my great pleasure to have this opportunity to speak with the ULA Sri Lanka community. I look forward to learning from library professionals in Sri Lanka and sharing some of the information services practices that have emerged during this pandemic period. We have seen the marked health and economic disparities that have only increased over the past two years. Increased expectation for material and workplace productivity have also necessitated that the current workforce becomes more adaptable and sophisticated. But who does this sudden shift in our society and economic marketplace displace? And what do these shifts mean for our two nations and what can we learn from each other? I hope that this conversation will lead to greater exchange between librarians and information providers in our two countries.

Tracie D. Hall
Executive Director
American Library Association (ALA)

ABSTRACT OF THE KEYNOTE ADDRESS

Information Access as a Social Infrastructure and Public Health Issue

Tracie D. Hall
Executive Director
American Library Association (ALA)
Chicago, United States of America

Observing that contemporary global access to education, employment, civic engagement and public health rely heavily on the connected access points of social and technological networks, Tracie D. Hall, the American Library Association's 10th executive director looks at what we can learn from the digital and on-the-ground innovations in information services in school, university, public, and governmental libraries that have occurred during the pandemic.

In addressing ULA Sri Lanka, Hall will focus on the role of libraries in aiding transformation in their communities and discusses the basic and leadership literacy necessary for library professionals. Referencing a body of well researched 21st century competencies necessary for socio-economic mobility, Hall prescribes pathways to competency. She will also lay out a descriptive roadmap for library leaders looking to guide their libraries through the shifts in organizational culture and deployment these times are calling for.

Contents

BARRIERS TO ACCESSING MEDICA L INFORMATION AMONG MEDICAL OFFICERS IN PRIMARY MEDICAL CARE UNITS (PMCUS) IN WESTERN PROVINCE IN SRI LANKA: A SURVEY

M.P.P. Dilhani[1] and Chandima Wadasinghe[2]

Abstract

The present study was conducted among the Medical Officers (MOs) in Primary Medical Care Units (PMCUs) in the Western Province of Sri Lanka regarding access to medical information sources and the barriers to accessing information. For which the survey method was applied, 83 questionnaires were distributed in all strata based on the proportional number of PMCUs, and 51 duly completed questionnaires were found appropriate for the analysis process. It was found that the main reason for the information requirement of MOs was to update medical knowledge for patientcare and clinical decision-making, for which they commonly access the information from the general browser and colleagues. The study also found that the most common barriers faced by respondents when accessing information resources were time constraints and the unavailability of libraries in the hospital and nearby. Also, the study revealed the barriers encountered that hampered the fulfillment of the information needs of MOs attached to PMCUs. The outcome of the present study will be helpful for information professionals, and medical and health librarians to understand the barriers to accessing MI (Medical Information) and develop the system for the fulfillment of the information needs of MOs accordingly.

Keywords: *Medical information, Information-barriers, Medical information sources, Primary Medical Care Units, Information accessibility, Sri Lanka*

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Introduction

In every country, efforts to improve health care in rural areas are hampered by a lack of trained personnel who have access to adequate and appropriate information resources. MOs who serve in PMCUs need a wide range of specialised information but have difficulty in locating and accessing information resources. MOs need to update their knowledge on par with the current treatment modalities, management guidelines, etc., to provide a better service. Therefore, information is a prerequisite for MOs as it also creates opportunities to share worldwide knowledge for their career advancement. When considering the Sri Lankan context, MOs served in PMCUs face critical healthcare problems exacerbated by isolation, poverty, scarcity of specialized personnel, inadequate transportation, and limited access to information. So that, MOs who serve in PMCUs face numerous challenges in keeping their practice current compared to the urban hospitals in Sri Lanka.

The present trend is to acquire medical information (MI) among the MOs, and the general population is also becoming more health-conscious than ever. Further, a drastic change in disease patterns and the emergence of new threats to global health necessitates using appropriate health information faster, more effectively, and economically. Information is important in any society, whether for professional or other reasons.

Due to the above facts, MOs who serve in PMCUs face a *"medical information access gap"* in obtaining necessary medical information in providing health services to the rural community and for their carrier development, compared to medical officers in teaching hospitals in Sri Lanka. In this context, MOs who serve in PMCUs in Sri Lanka are apparently in a disadvantageous position in accessing medical information.

Objectives

The objective of the study is to examine the barriers that encounter in the accessibility of medical information by MOs who serve in PMCUs.

Literature Review

A review of the literature is an important component of research studies that describes the pertinent literature, aids in researchers' comprehension of what has been done and what needs to be done, and adds to their understanding of the body of knowledge on a particular topic. It was possible to find pertinent information regarding barriers to accessing medical information from a number of different sources.

Dolea (2009) stated that "with the present inequity of distribution of MOs and specialists in Sri Lanka, it is difficult to mention that there is an impartial health service except in the case of the public health services". This clearly indicates the visible imbalance in the distribution of MOs in the country and the low level of medical facilities provided to rural and remote medical centers that serve the majority of the population and tends to place the rural citizen at a high level of health risk. According to health statistics (Ministry of Health, 2017), 72.7% of medical specialists serve in urban centers, 25.1% in semi-urban areas and only 2.2% serve in rural areas. According to the Ministry of Health (2016), 80% of its main healthcare centers are located in cities. Ely *et al*. (2005) and Lappa (2005) stated that "critically, doctors are usually busy and do not have enough time to search extensively for information to answer their clinical questions from the indirect resources". González-González *et al*. (2007) concluded that "primary care doctors answer only one out of five clinical questions during the consultation".

Furthermore, Dee & Blazek (1993) and Ely *et al*. (2005) stated that "doctors need the most relevant, accurate and up-to-date information while they are with the patient in the examination room to provide high-quality services". Therefore, rural communities are at a greater disadvantage in receiving efficient healthcare services. According to the findings of the surveys carried out by Amararachchi *et al.* (2013) and Dilhani *et al.* (2020), due to geographical and infrastructure based barriers, the MOs in rural areas are at a disadvantage state when compared to the MOs in urban areas in Sri Lanka, and they do not have access to medical information and have unmet needs on clinical problems and day to day medical practice. Health statistics revealed that there is a scarcity of specialist doctors in rural and remote areas (Ministry of Health, 2016). Several barriers are consistently apparent from the reviewed studies covering the period of 1990 to 2017: lack of time, isolation, lack of library services, technology illiteracy, lack of equipment, and demands of strenuous practice. Although many of these barriers are shared by urban health professionals, these appear to be more prominent among rural health professionals (Clarke *et al.*, 2015; Davies & Harrison, 2007; Kostagiolas *et al.*, 2018; Pakenham-Walsh & Bukachi, 2009).

Methodology

The study is mainly concerned with the purpose of examining the barriers encountered in the accessibility of medical information by MOs who serve in PMCUs. The survey method was used for the study. The Primary Medical Care Units are the study locations, and a total of 514 PMCUs are existing in the country according to the Health Institutions Numbers List

published by the Ministry of Health, Sri Lanka. Out of 514 PMCUs in the country, 83 PMCUs in the Western Province were selected for the study, which includes 33 PMCUs in Colombo District, 05 PMCUs in Kalutara District and 45 PMCUs in Gampaha District. Accordingly, the study population consists of 83 MOs in PMCUs in Western Province in Sri Lanka. The data collection was carried out from 12/04/2022 to 12/06/2022. Google form was designed and distributed among MOs attached to PMCUs to collect information, which consists of closed-ended and open-ended questions. To ensure the quality of data, Cronbach alpha which measures the internal consistency of each question with the other questions in the measurement was applied. MS Excel was utilised for the data analysis.

Data Analysis and Interpretation

Based on the proportional number of PMCUs, a total of 83 questionnaires were distributed to all shifts, and only 56 responses were received, with a response rate of 67.46%. Among the duly completed questionnaires received, five were discarded due to lack of completeness of the information. Subsequently, 51 (61.45%) duly completed questionnaires were found to be suitable for the analytical process.

Reasons for Accessing Medical Information

Table 1 provides information on why MOs requied medical information. Study revealed that different information may be used for different purposes, and different purposes may influence the information needs. In this survey, MOs were asked to identify the purposes for which they need information, considering important common reasons such as complaints, treatment options, and continuing education. Respondents had given the opportunity to select multiple reasons when answering the question.

Table 1: Reasons for accessing medical information by MOs in PMCUs

Reasons/ MI	To be up to date	Patient care	To write research paper	Answer patients'/families' questions	Answer colleagues' questions
Patient data	51	51	04	41	45
	100%	100%	7.84%	32.96%	88.23%
About diagnosis	51	51	06	43	46
	100%	100%	11.76%	84.31%	90.19%
Physical signs and	51	51	04	23	46

symptoms	100%	100%	7.84%	45.09%	90.19%
Disease conditions	50	51	05	41	50
	98.03%	100%	9.80%	80.39%	98.03%
Laboratory tests & Radiology	51	51	03	38	48
	100%	100%	5.88%	74.50%	94.11%
Treatment modalities	47	47	02	24	48
	92.15%	92.15%	3.92%	47.05%	94.11%
Drugs information	51	50	02	25	32
	100%	98.03%	3.92%	49.01%	62.74%
Population statistics	25	12	01	05	18
	49.01%	23.53%	1.96%	9.80%	35.29%
Medical guidelines	47	48	02	14	48
	92.15%	94.12%	3.92%	27.45%	94.12%
New Medical equipment	50	50	02	24	35
	98.03%	98.03%	3.92%	47.05%	68.62%

As seen from Table 1, majority of the MOs accessing MI for to be up to date, patient care, to answer patients' and their families' questions and colleagues' questions. It is almost certain that the main reason for using the different kinds of information is to provide patient care and to be up to date. Furthermore, the most common type of information that the large proportion of MOs use are general information related to diagnosis, patient data, treatment, lab tests and radiology, drugs information, disease conditions, and physical signs and symptoms in order to provide patient care.

Barriers Encountered by MOs in the Context of Meeting their Information Needs

Although MOs generally have a level of satisfaction with information obtained from different resources and channels, the study revealed certain problems they faced during the process.

Table 2 shows that MOs encountered different problems when searching for human and paper-based resources. Data suggested that a larger proportion of MOs reported the issues, such as lack of access and time to search for required information, geographic isolation and unavailability of library facilities. In addition, data revealed that lack of access to books, newsletters and journals is considerably higher than human resources. Unavailability of library facilities is pointed out by higher proposition of the respondents.

Table 2: Problems Encountered by MOs Serving in the Urban Areas when Searching Human and Paper-Based Resources

Sources/ Barriers	Books	Journals	Newsletters	Human Resources
Accessibility issues	45	47	35	39
Insufficient time to search	48	47	45	49
Geographic isolation	39	52	51	37
No Library facilities	51	51	51	51

Table 3: Problems Encountered by MOs when Searching Electronic-Based Resources

Sources/ Issues	The Internet	Online Databases
Accessibility issues	19	07
Insufficient time to search	14	12
Lack of credibility	10	05
Inadequate computer skills	12	18
Inadequate electronic search abilities	19	26
Inconvenient venue	14	15
Inadequate computer specifications	14	20
Slow electronic speed/Poor Bandwidth	13	31

Regarding electronic-based resources, the results in Table 3 suggest that fewer MOs face problems with the internet compared to online databases. In addition, the Table 3 shows that accessibility issues, insufficient time to search and lack of credibility are more common problems with online databases than with the internet. On the other hand, inadequate electronic search abilities, inadequate computer specifications and slow electronic speed are more common with the internet than online databases.

Furthermore, the barriers enconuted by the MOs in accessing MI is illustrated in Figure 01. In Figure 1, the qualitative data analysis revealed that MOs have several challenges in accessing MI. However, in addition to previously stated problems, there are various other barriers pertaining to personal issues, such as unsatisfaction, unavailability and inaccessibility of MI from paper-based or electronic-based media have been indicated.

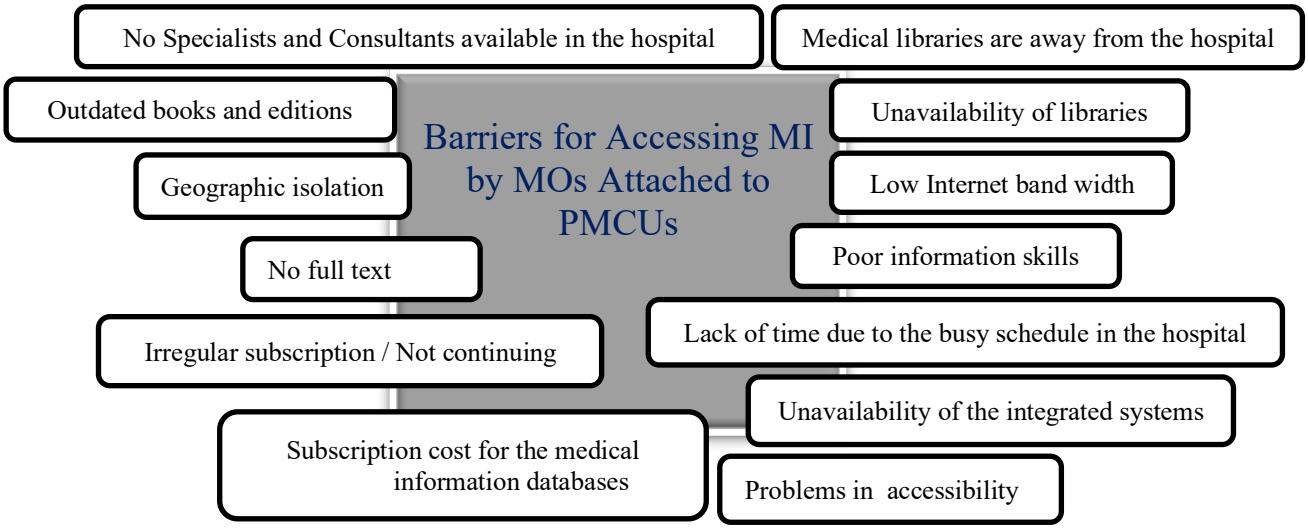

Figure 1: Barriers Encountered by MOs when Accessing MI at PMCUs

Conclusion

In conclusion, this study revealed that MOs have more information needs when working in clinical and educational contexts, patient care-centred responsibilities (diagnosis, treatment, and medication) and settings, where they are expected to do certain activities like decision-making and managing patient health issues. Also, the present study assessed the barriers encountered by MOs attached to PMCUs in accessing MI. According to the study findings,

- MOs have a variety of information demands that occur throughout patient care.
- MOs access essential MI through online databases, the Internet, books, journals, and newsletters, and they depend on human resources as well to update their medical knowledge.
- The most common barriers faced by the respondents when accessing information resources were time constraints and issues with inadequate electronic search abilities or online resources.

However, individuals encounter numerous obstacles while attempting to access information sources, too. The most frequent of these were time restraints, IT or online resources issues, a lack of search expertise, the expense of database subscriptions and medical supplies.

Also, the study showed that MOs are overwhelmed with the vast amount of information available through electronic resources and the internet, however these information is underutilized due to a lack of appropriate information skills. This study also revealed that providing "successful" accessibility for medical information by minimising barriers would

entail using a variety of information sources (digital, conventional, and interpersonal) and removing potential obstacles (environmental, informational, and digital literacy) that could stand in the way of the accessing MI process. The overall findings of the study made it clear that there has to be a significant change in the way the system for making medical information accessible in PMCUs in Sri Lanka should be built and improved. It is obviously crucial that a much-needed medical information service is supported by top-notch materials and cutting-edge technologies, even though change is probably going to take some time.

The outcome of the present study will be helpful for information professionals to understand the accessing barriers to the MI of MOs serving in the PMCUs.

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MOTIVATION AND ANTECEDENTS OF USER ENGAGEMENT WITH JOB ADVERTISING WEBSITES IN SRI LANKA

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Abstract

With the intense advancement of technology, in order to seek new job opportunities, young people tend to use social media and the internet. This behaviour has been accelerated by some positive influences such as ease of navigation, attractiveness, information provision as well as usability of the website of online job advertising sites. Despite the fact that Sri Lanka has a large number of job advertisement websites, job seekers only use a select handful of them to look for employment. Therefore, the purpose of this study was to examine the influence of pre-identified factors through the pilot study on users' engagement with job advertising websites in Sri Lanka. Moreover, through this study, it was expected to explore what features users enjoy most on job promotion sites that drive them to re-visit and recommend them to their peers. Data collection for this study was completed through self-prepared questionnaires, which are distributed to final-year students of the University of Ruhuna and selected 300 undergraduates based on a purposive sampling technique. Data analyses were done as descriptive statistics, and Coefficients to find the influence of the variables using SPSS. The results demonstrated that the ease of navigation has a significant impact in favor of users' engagement and website usability has less significance. The findings of this study revealed the three factors respectively ease of navigation, attractiveness, and information provision that have a significant impact on users' engagement. The findings of this study are very much beneficial to online job promotion website developers and through this study, the researchers reflected some features that have to gain the attention of online job promotion website developers such as the accuracy and consistency of information, the attractiveness, ease of navigation and website usability.

Keywords: *Advertising sites, Job advertising, Job promotion, Job seeking*

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Introduction

The global economy has grown alive and dynamic, and every firm must always look for ways to increase their productivity, efficiency, and competitiveness if they want to lead their respective industries. According to Mansourvar et al. (2010), businesses should commit to becoming ready for the big global game by increasing their efficiency and competitiveness to provide high performance. Therefore, in order to increase productivity, market share, and shareholder value, businesses should make an effort to entice the appropriate candidates with the right abilities into the right roles.

Moreover, due to globalization, communication converts as an essence for daily activities in every firm. As a result,communication methods have developed rapidly while touching new technologies. Information resources have become a key player and their rapid development has contributed to the firms being the pioneers of their expertise. Also, information resources help to increase productivity and human capacity. When considering modern communication tools, internet service is the most effective and useful tool, and the World Wide Web (WWW) is a very popular method for internet services.

To attract the right people to the right position at the right time, many organizations tend to use E- recruitments methods and Job posting websites are playing a vital role. By aggregating and advertising available telecommuting and local openings, job-posting websites act as the current version of classified adverts. Using a job posting website is one of the greatest and most effective ways to search for and apply to thousands of possibilities. Job posting websites got millions of postings, extra services like career coaching, resume writing, and blog entries full of useful ideas (Cober et al., 2004).

According to Calder et al. (2009) internet job search is not a new way to look for work. It has an aspect of every worker's job search strategy, which that strategy is different from person to person. Nowadays, a lot of job searchers use the internet to get employment. Additionally, a lot of businesses post job openings on their portals, companies have no choice but to use this strategy if they want to get top-notch human resources. Some internet users in Sri Lanka are gathering job vacancy information via using internet job portals such as topjob.com, observerjobs.lk, and dreemjobs.lk, etc (Shezad, 2021). Even though most of the young generation is technology savvy and uses these modern methods, still some people do not use the internet to find jobs and they use traditional ways for job search like newspaper advertisements.

Organizations have taken the advantage of modern information services and have used them for their recruitment. They use the internet as a service in several ways like posting an

advertisement on an internet job board, posting an advertisement on a company website, or a professional-organization website. The e-recruiting is providing the right type of information, at the right time, to the right person with several clicks. Additionally, job seekers can find hundreds of competent applicants for jobs at any level by simply getting into the Internet. Cober et al., (2004) identified four variable influences on the quality of e-recruitment. According to the study's results, e-recruitment procedures fluctuate significantly depending on the organization type, size of the organization, and respondent group. This is indicated by the associates' comments regarding the substantial importance of these activities. In contrast, the organization type gives e-recruitment identical weight. However, there isn't yet agreement on how to accurately operationalize and evaluate the usability of websites (Cober et al., 2003).

When using computer-based technologies, the concept of "user engagement" incorporates behavioural, cognitive, and emotive reactions (Alwreikat & Rjoub, 2021). As mentioned by Doherty (2010), progressive user engagement starts with interactive media interfaces, user evaluation of those interfaces, deeper consumption of media material, and behavioral impacts

Due to the dynamic and complex nature of user engagement, the scale components' stated fluidity, and the need to determine whether the measure allows meaningful comparison across various work contexts and program features, more research is required. Comparing user engagement in response to various software sensory cues also requires research.

As a pilot survey to this study, researchers had taken details from recruitment website administrations to identify user engagement with their websites. Based on the overviews of user engagement of each website, the researchers could be able to recognize that there is a difference in user engagement on each job posting website. As past researchers have conducted research on user engagement on particular websites in their contexts, the researchers were motivated to continue the research to find out what kind of factors affected to have the gap in user engagement in Sri Lanka's job posting sites. Because though there are several websites in Sri Lanka that post job openings, only a small number of them are used by job searchers, and that scenario has motivated researchers to conduct this study.

The main aim of this study is to determine the factors affecting user engagement of online job advertising sites in Sri Lanka. The following hypotheses were developed to test.

H1: Ease of navigation of websites makes an impact on user engagement of online job advertising sites in Sri Lanka

H2: The attractiveness of websites makes an impact on user engagement of online job advertising sites in Sri Lanka

H3: Usability of the websites makes an impact on user engagement of online job advertising sites in Sri Lanka

H4: Information provision of websites makes an impact on user engagement of online job advertising sites in Sri Lanka

The results of this research are very important to identify the factors affecting user engagement of online job advertising sites in Sri Lanka. Also, this study helps to identify the influences of the factors to improve behaviour of job searching through the internet. Further, this study is very important for website designers and managers, because, creating a usercredible website is very hard, and if the website is very poorly designed, the users move away from the site. Limitations of this study are the study is limited to the University of Ruhuna and it is better if this can cover the entire university system in Sri Lanka. The lack of availability of previous research relating to this study, especially in the Sri Lankan context is also another limitation.

Literature Review

A. Recruitment

Recruitment is both practices and activities to identify the "organization's primary purpose and identifying and attracting potential employees". Also, Recruitment is an important function of human resource management it executes the important function of human assets in the organization (Alwreikat & Rjoub, 2021, p. 3).

i) E-recruitment: Many businesses deliberately assess e-recruitment for growth potential and viability in order to get the right candidate at the right time for the right price. However, everything has altered because of the Internet's evolution. The standard Internet protocol suite (TCP/IP) is used by the Internet, a worldwide network of interconnected computer networks, to connect more than a billion devices. It consists of many networks. Therefore internet communication was expanded wide area. Sri Lankan internet users are growing day to day (Teoh, Tan & Chong, 2013).

The rise of the Internet for job search and recruitment reduces traditional recruitment channels. Also, the internet and the development of e-recruitment processes have the power to alter organizations' and job seekers' perspectives on the recruiting process (Sharma & Medury, 2010). This type of recruitment is earning more advantages. The main advantage is reducing application-processing costs and can attract more job seekers that are qualified within a few

days. In another word, e-recruitment was able to attract and retain high-quality people and gain competitive advantages (Van Birgelen, Wetzels &Van Dolen, 2008). Today, recruiters are aware of the advantages of using e-recruitment to find and hire the top candidates on the market. The E-recruitment process performs the activities associated with recruitment more quickly and accurately while also enhancing the recruiting process. It is also a more beneficial and effective means of hiring than previous approaches.

ii) *Traditional recruitment and e-recruitment:* The conventional manner of recruiting has also changed in the Internet Age. Newspaper advertisements were the primary formal external method of posting a job opening and luring applicants, according to Webster et al. (2006). But with the increasing use of the internet, many numbers of organizations and individuals are using the internet and electronic mail for the recruitment process. Also, internet recruitment may be more effective than newspaper ads (Malthouse & Calder, 2010). The internet has helped in attracting suitable candidates to an organization or business from the special recruitment process. It is called Electronic Recruitment (E-recruitment) and known as Online Recruitment, or Internet-based recruitment. But E-recruitment is not the only alternative to traditional recruitment, because e-recruitment is more than the traditional way. And also Puncheva-Michelotti et al. (2018) said the recruitment process has changed in recent years with e-recruitment.

iii) Methods of E-Recruitment: E-recruitment can be done by several methods. Commercial Job Boards and Corporate websites are very famous and main methods. Commercial job boards like classified ads in the newspaper and it is a common website for any organization and job seeker. A major advantage of the job board is many people/job seekers watch, and the organization's cost is low. Those websites also provide useful information about an organization as well as vacancies for jobs. It is the main advantage of this method. (Khan, et al., 2013)

iv) Website design: Web design around many different skills in the production and maintenance of websites. The different areas of web design like interface design, graphic design, software engineering, programming, and search engine optimization. If a website didn't have a perfect website design, some users do not see that website. More than 20% of job seekers have rejected job opportunities simply based on poorly designed websites (Whitfield et al., 2010)

B. User Engagement

When using computer-based technologies, the concept of "user engagement" incorporates behavioural, cognitive, and emotive reactions. Users' initial "evaluation of, and

interaction with, interactive media interfaces, followed by deeper absorption in media content and behavioural effects" are the first steps in the user engagement process (Rivers, 2016, p. 5). As a result, it offers a "succinct lens" through which to integrate and deal with a number of well-established branches of human-computer interaction research.

*i) Key Design Elements for User Engagement on Job Posting Sites:*A website that focuses solely on job seekers or careers is called a job posting site. Many jobs posting websites, also referred to as job boards, are created to enable companies to list job requirements for a position that needs to be filled. A potential employee can find the job application on a job website, complete it online, and submit their resume for the open position. When defining and operationalizing each of these components, the research investigations revealed that easy access to pages (many pathways and minimal clicks/backtracking) and navigation aids (e. g., visible links) are prerequisites for effective navigation.

C. Theories Related to Information Seeking Behaviour

Most researchers suggested many model**s** for research and investigation of the individual acceptance behaviour on information technology/information systems, i.e. the Theory of Reasoned Action (TRA), Theory of planned behaviour (TPB), Technology Acceptance Model (TAM), and Unified Theory of Acceptance and Use of Technoloy (UTAUT).

i) Technology Acceptance Model (TAM): Technology Acceptance Model has been developed by Davis in 1989 to identify computer usage behaviour and factors influencing with acceptance of technology (Thuseethan et al., 2014).Technology Acceptance Model was based on the Theory of Reasoned Action (TRA) introduced by Davis, Bagozzi, and Waeshaw in 1975.

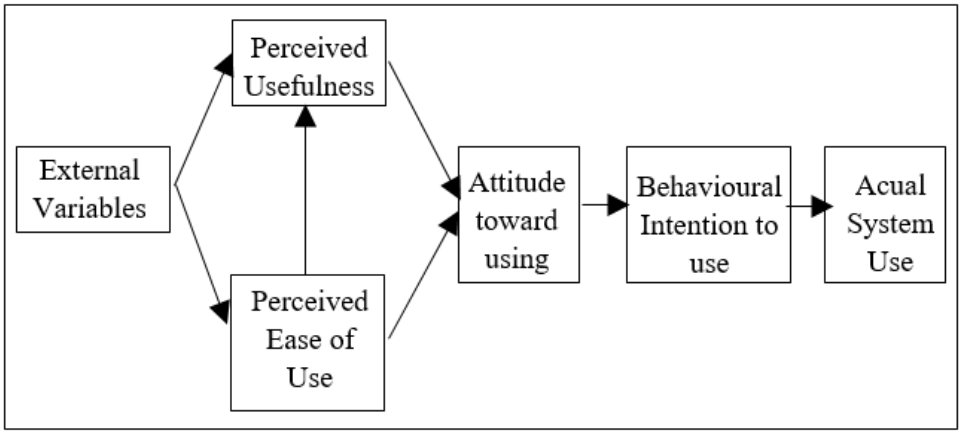

Figure 1: Framework of Technology Acceptance Model (TAM)

(Davis, 1989, p.8)

According to Davis, Technology Acceptance Model has two main constructs. One is Perceived Usefulness, this is the degree how much enhance**s** the user's performance. The new technology or system was more useful, the more positive is user's attitude toward using the new technology or system. The second one is Perceived Ease of Use, this measures how simple it is to use a new system or piece of technolog y. The user's attitude toward using the technology or system will improve if the new system is relatively simple to use. Davis also uncovered two more constructs: behavioural intention to use and attitude toward using. Davis (1993) claimed that the following characteristics were part of the TAM model, which fully mediated the impact of system design features on usage: attitude toward using, perceived usefulness, and perceived ease of use.

D. Empirical Review

O'Brien & Toms (2010, p.1) proposed six dimensions of user engagement, including (1) "Aesthetics, the visual appearance of the website; (2) Endurability, perceived task-technology fit resulting in intention recommend to others; (3) Felt Involvement, cognitive immersion in the task; (4) Focussed Attention, flow state that results in temporal and environmental disassociation; (5) Novelty, pleasurable cognitive stimulation and (6) Perceived Usability, the degree of cognitive effort and affective frustration experienced during use".

Ojedoja (2016) researched to determine the elements that affect university students' impressions of Internet recruitment in Malaysia. Three specific elements formed the basis of that investigation. User-friendliness, information availability, and website usability are taken into account. The researcher's main finding is that younger generations, especially college students, have favourable attitudes regarding e-recruitment methods. Additionally, a lot of employers today offer their opportunities on their portals, and many job seekers search for work online.

To determine the elements affecting Online Customer Satisfaction from Sri Lankan Perspective, Khan et al. (2013) conducted a study. The researchers identified the precise factors of online consumer happiness in order to accomplish the study's goal. As a result, the researchers had to choose a valid procedure for determining the factors that affect online consumer satisfaction and that can be applied to the creation of a conceptual model that can be supported by data. The researchers were able to identify various online consumer satisfaction factors such as website security, user participation, customer service, useful product information, ease of the purchasing process, further information, navigation, and product offerings.

A descriptive study on the effects of e-recruitment on human resource supply chain management was done by Mansourvar et al. (2010). It is anticipated that the study's recommendations will provide some guidance for organizations looking to increase the efficacy of their online recruiting efforts. In a nutshell, employment sites must be user-friendly, and website designers must take into account all the qualities that satisfy youthful job seekers' expectations while building a website's interfaces (Puncheva et al., 2018). Government organizations with employment portals and online recruitment firms must regularly assess the usability and friendliness of their websites and make any necessary aesthetic adjustments.

Khan et al. (2013) conducted a study on Internet job search and unemployment lengths to determine the categories of jobless workers who looked for work online and whether they found new employment more rapidly. The authors concluded that internet job search does speed up reemployment and is more common among workers who exhibit the qualities that are often linked to speedier reemployment. The authors made the point that using the internet to find a job could greatly enhance search results for criteria like employment quality, which they did not examine in their study.

Whitfield et al. (2010) evaluated the viewpoints, career expectations, and job-searching behaviours of a sample of business students for their study on the future generation at work. The authors performed a field survey with 20,771 students across Canada to examine university students' perceptions of careers, organizations, and careers as well as how they view their organizations. The study's multiple regression analysis revealed that cooperative students reported higher levels of self-assurance, appeared to have more reasonable expectations, and had a deeper understanding of their talents and objectives. It also showed that the respondents had low expectations for the career centers at their schools to assist them in finding work and intended to use the internet more frequently in their job searches. This suggested switching from outdated recruitment techniques to more contemporary ones, such as the internet.

Additionally, high-tech sectors are not the only ones using the Internet for finding and hiring. Enterprises with a connection to computers are indeed more likely to find online hiring useful. However, the majority of recent college graduates now consider the Internet to be a key resource for assistance in finding career prospects, with non-technical professions accounting for 65% of all Internet job seekers (Marcel et al., 2008)

Methodology

A. Conceptualization of Variables

A research framework is constructed as shown in Figure 2, The framework shows the relationships between the independent variables (Ease of navigation, Attractiveness, Information provision, and Website Usability), and the dependent variable (User engagement of online job advertising sites).

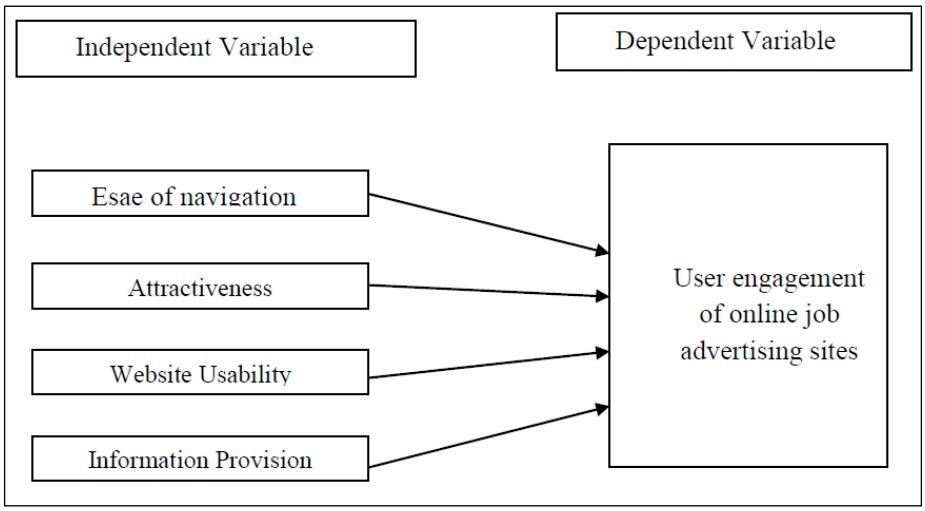

Figure 2: Conceptual Framework

B. Operationalization of Variables

According to the above conceptual framework, the operationalization has been developed as follows

Variable	Dimension	Indicator
Ease of navigation (Independent Variable)	Less effort	Online job portals provide immense service to job seekers
		Ability to find a job opportunity easily
		Filtering facilities are available on the websites
	Saving Time	Can find more jobs within less time
		Job Websites' efficiency is high
Attractiveness (Independent Variable)	Graphics	Sites display attractive colours to the eyes
		Appropriate images and icons have been used
		Appearance increases the willingness to search for jobs

	Professional look	Professionals look to the right place that can remind
	UX/UI Design	Effective interfaces are providing
Website Usability (Independent Variable)	Effective Use	Can apply for a job through the site itself
	Ease of Use	An effective set of navigations is provided
	Clean	Unnecessary information is avoided
	Consistency	Advertisements are maintaining consistency
Information Provision (Independent Variable)	Correctness	Ambiguity information is not provided
	Trustworthy	Looks like admins maintaining a good relationship with job offers
		All the important information ~~have~~ has been provided
	Timeliness	Websites are updated frequently
User engagement of Job advertising sites (Dependent Variable)	Frequency	Frequency of visits to the sites
		Staying many times at one site
	Recommend	Recommendation for online job searching
	Willingness	High willingness to search for jobs online

Figure 3: Operationalization

C. **Methodology**

The study was based on a quantitative research design and the research steps applied were in accordance with scientific research design. Explanatory research served as a foundation for the current study. It was defined as an effort to link concepts to comprehend cause and effect, i.e., researchers are trying to explain what is happening. The explanatory study also examines how elements combine and communicate with one another. There is enough knowledge from this research to date to start making rather accurate predictions about what will happen next. Numerous academics assert that studies that test hypotheses or provide an explanatory framework frequently find correlations or differences between groups on a particular variable or set of variables. The goal of this study is to identify the variables influencing Sri Lankan online job posting site users' participation. In order to ascertain how independent factors, affect the dependent variable, this study is a hypothesis investigation. There are many other ways to gather data, including experimentation, survey research, observation, case studies, and action research. The survey method was employed in this study to get the data. When the researcher is aware of precisely what is required and how to measure

the variables of interest, questionnaires are an effective method for gathering data. The distribution of questionnaires can be done electronically, by mail, or in person. In this study, the researchers distributed the questionnaires online.

This research is very related to final-year students because final-year students are very close to the job market. The researcher selected the 300 participants' final year students of the University of Ruhuna. The sample of this research was selected using the purposive sampling technique after using a simple random technique. The researchers specifically selected few job advertising websites in Sri Lanka to observe the user engagement behaviour towards the advertising posts in the websites. *Topjobs.lk, observer jobs, ikman jobs, dream jobs, express jobs, mytutor jobs*, and *careerfirst*.

The primary data evaluated using a structured questionnaire, which was consisting of two sections. Section one was about the demographic information of the respondents and section two was about their information-searching behaviour. The unit of analysis was an undergraduate.

Descriptive and inferential statistics were employed in this study to support the quantitative aspect of the data gathering. Measures of central tendency (mean, median, and mode) and measures of dispersion are typically used in descriptive statistics (variance, standard deviation, etc.) The hypotheses were tested using multiple linear regression, and correlation coefficient. The relationship between variables is explained through correlation. To determine the link between the dependent and independent variables, the study employed correlation analysis. The data analysis tool utilized was the Statistical Package for Social Science (SPSS).

Results and Discussion

Table 1 shows the time spent by final-year students seeking jobs online. Out of the sample, the majority of respondents are female students and it is about 56%. When considering the time, all the respondents are engaged in seeking online jobs through visiting online job advertising sites and the majority of respondents (147 – 49%) spend more than 02 hours per week seeking job opportunities advertised online.

Table 1: Gender Vs. Time is taken to seek jobs online

Time consumes for job seeking on the internet	Male	Female
Less than 1 hour	25	18

From 1 to 2 hours	58	62
More than 2 hours	48	99
Total	131	169

Moreover, the study considered the following demographic factors gender, age, faculty, and degree. According to sample data analysis, factors affecting user engagement in online job advertising sites are different with gender and faculties. But age and education areas are not influenced by the user engagement of online job advertising sites. Mostly the respondents are engaged in websites such as express job, ikman jobs, topjobs.lk, and mytutor jobs for seeking job opportunities.

Internal consistency of the variables was checked by running the Reliability analysis test and Cronbach's alpha values were in a range of 0.74 – 0.86 (Table 2). It can be concluded as the data collection tool and its content was internally consistent with each other.

Table 2 : Reliability Analysis Results

Variables	Cronbach's Alpha	Number of Items
Ease of navigation	0.866	5
Attractiveness	0.892	5
Website usability	0.807	4
Information provision	0.861	4
User Engagement	0.746	4

Descriptive statistics were calculated to test the basic nature of the responses provided by the respondents. Mean, Standard deviation and Skewness shows different aspects of the responses. All the mean values as shown in table 3, range from 3.27-3.49. The values have reached a moderate level of agreement with the provided statements when collecting data. Therefore, it can be concluded as there is a moderately high agreement in engaging and seeking jobs advertised online.

Standard Deviation of considered factors for the study ranged from 0.72 – 0.78. All the values are moderately high and it implies all the responses were spread out over a wider range of values. When considering the skewness, there is a negative skewness and it has a kind of distribution in which more values are concentrated on the right side (tail) of the distribution graph.

Table 3: Descriptive Statistics

	No. of Respondents	Min.	Max.	Mean	Std. Deviation	Skewness
User Engagement	300	1	5	3.27	0.787	-0.150
Ease of navigation	300	1	5	3.49	0.722	-0.370
Attractiveness	300	1	5	3.37	0.733	-0.405
Website usability	300	1	5	3.46	0.734	-0.474
Information provision	300	1	5	3.42	0.742	-0.257

In order to understand how independent factors affect the dependent variable, regression analysis was performed. Regression analysis demonstrates the overall fit of the model, and the results are shown in table 4. Multiple regression analysis was used to evaluate the theory. According to the result, adjusted R^2 was 0.634 and it implies that 63.4% of user engagement of online job advertising sites was described by the selected independent variables and the rest 36.6% was represented by the other factors which have not been considered by the researchers.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
1	.780[a]	.634	.603	.518	1.941
a. Predictors: (Constant), IP, Attractiveness, EN, WU					
b. Dependent Variable: User engagement of online job advertising sites					

Then the regression coefficient test was performed to identify the impact of independent variables on the dependent variable. Based on those values the acceptance/rejection was decided. When the sig. values less than 0.05, the hypotheses were accepted, and the following table shows the test results.

Table 5: Coefficient Results

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t.	Sig.
	B.	Std. Error	Beta		

(Constant)	0.042	.154		.275	.784
Ease of navigation	0.426	.069	.391	6.209	.000
Attractiveness	0.205	.069	.191	2.967	.003
Website usability	-0.022	.079	-.020	-.276	.783
Information Provision	0.330	.071	.314	4.625	.000
a. Dependent Variable: User engagement of online job advertising sites					

According to the above table, except for the website usability factor, all other factors were statistically supported that they made an impact on the user engagement of the online job posting sites in Sri Lanka.

Conclusion and Recommendations

This study is based on four independent variables of ease of navigation, attractiveness, website usability, and Information provision. The results of this study showed that four factors significantly affect how users interact with Sri Lankan online job posting websites. Amongst the four factors, ease of navigation appears to be the strongest predictor. In this study, it was found that website usability had little impact on the user engagement of online job advertising sites in Sri Lanka.

According to sample data analyses ease of navigation, attractiveness, and Information provision are significantly important for increasing user engagement in online job advertising sites. But website usability is not significantly for the user engagement of online job advertising sites. Finally, the researcher recommends that while designing the internet job site should focus on the information provided and have to consider the ease of navigation and attractiveness, same time should give a little attention to website usability.

Identification of the most significant factors in user engagement on job advertising sites will be useful to design and develop websites for the job-advertising firm and designing and recreate organizational strategies. Instead of paper advertisements, job-advertising sites facilitate new updates regarding vacancies and advanced searching facilities by keywords simply for many categorical users. In addition, a more comprehensive study using several other influences of job advertising websites on User Engagement hypotheses can be examined in the future. The impact of job marketing websites on user engagement could be tested and predicted using a larger sample size and additional factors. Additionally, a variety of job advertising companies that were not the subject of this study evoke varied user motives for interaction with their content. Further research can be done on these businesses.

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A COMPARATIVE EXPLORATION OF INFORMATION SEEKING BEHAVIOUR OF THE ACADEMIC COMMUNITY: THE CASE OF MALDIVES NATIONAL UNIVERSITY AND CURTIN UNIVERSITY, AUSTRALIA

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Abstract

This paper explores the information seeking behaviour of the academic community in two diverse countries with the purpose of understanding the place of libraries in the current online information environment. Studies on information seeking behaviour from developing countries are few and there is no evidence of a comparison of academic information seeking behaviour across information-rich and poor economies. A mixed methods approach was used to compare the information seeking behaviour of the academic community of two universities, one from the Maldives as a developing country, and the second from Australia as a developed country. The main data collection was through a quantitative online questionnaire from a random sample of staff and students from both the universities. A purposive sample from the Maldives was taken for in-depth interviews to inform the survey questions. The academic community's information seeking behaviour is shaped by the level of information accessibility through the respective library, with no significant distinction between the sample-groups (staff and students) within the academic community. However, in both countries, information seeking is centred largely on Google searches. Conversely, reliance on libraries and perceptions of their relevance are found to be higher for the developed country than for those from the developing country. Irrespective of the hype about increased universal access to information sources on the internet, it is the library collections that add value to Google searches. The findings caution the precarious status of academic libraries in developing countries such as the Maldives.

Keywords: *Information seeking behaviour, Academic libraries, Information divide, Goggling phenomenon, Information behaviour*

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Introduction

This paper presents part of a larger study into the 'I can Google it' information seeking behaviour with emphasis on two distinct academic communities: Maldives and Australia. The term *academic community* in this paper refers to undergraduate (UG) and postgraduate (PG) students, as well as academics in the Maldives National University (MNU) and Curtin University (Curtin), Australia.

Considerable research has been carried out on the use of Google as an information source by evaluating the relevancy of search results retrieved through Google compared to library sources (Georgas, 2013). The literature predominantly concludes that while library sources are superior in quality (Brophy & Bawden, 2005) Google has gained popularity because of its convenience and reliability (Howland et al., 2009). Moreover, with the Net generation's high reliance on the online media, there are indications of an *I can Google it* mind-set that results in users bypassing libraries as an information source (Nicholas & Clark, 2015; Rowlands et al., 2008). Anecdotally, the academic community from the Maldives also perceives a decreasing need for libraries in the presence of Google.

Accordingly, the objective of this paper is to:(1) understand the information seeking behaviour and prevalence of the *I can google it* perception among the academic community, and (2) explore whether this perception is similar across diverse economies.

Literature Review

The first known attempt at looking at what people read and how they access it, is the work of Professor Waples from the Graduate Library School of the University of Chicago in 1937 (Lynd, 1938). The literature shows that his conceptualisation of sociology of reading branched out into theories of 'information behaviour', 'information needs', 'information seeking behaviour', and in the electronic information environment to concepts of 'information search process' and 'information retrieval' (Wilson, 1999; Kuhlth au, 2005;Ellis, 2005;Knight & Spink, 2008).

Delving into the definitions of these terminologies and how they have evolved is not the focus of this paper. However, taking Bates's (2010) definition of information behaviour as "ways in which human beings interact with information, in particular, the ways in which people seek and utilise information" (p. 2381),it suffices to posit 'information behaviour' as the overarching concept for this investigation. Wilson (1999) theorised information behaviour as consisting of information seeking and information search behaviours as its two main sub-concepts.

Based on an analysis of prior theoretical models Knight and Spink (2008) present nesting of models that summarises the plethora of information searching, information seeking, and information retrieval (IR) theories into one macro model (see Figure 1).

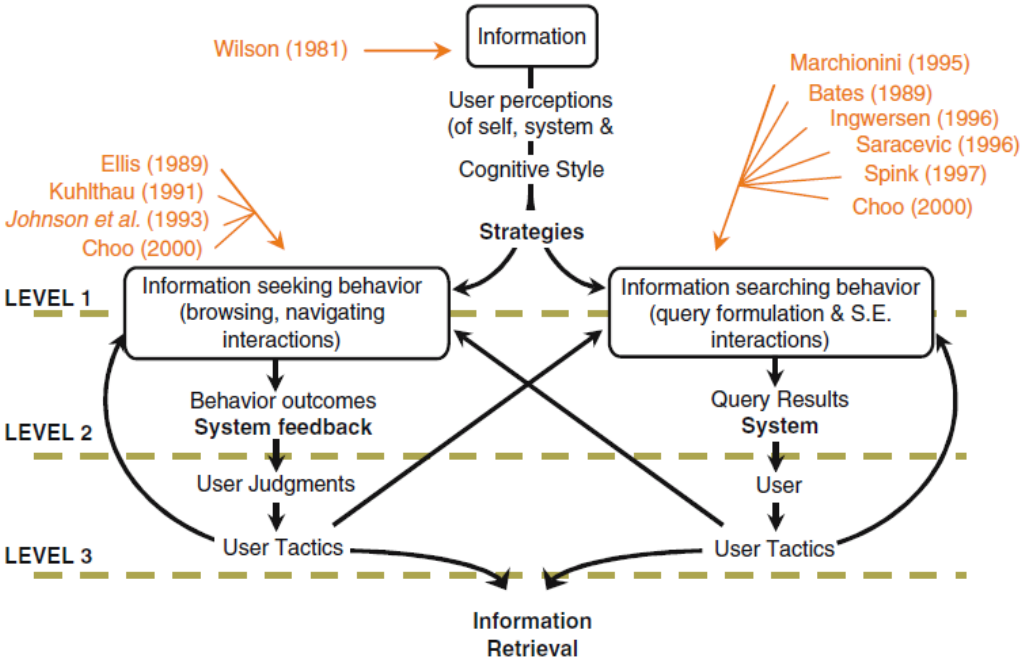

Figure 4: Information Retrieval Behaviour on the Web (Knight & Spink 2008, p. 230)

The distinction in information seeking versus information searching behaviour is summarised by Joseph (2016) as the 'user-related' versus the 'system-related' information behaviour. Most of the information behaviour research (Griffiths & Brophy, 2005; Du and Evans, 2011; De Groote, 2014; Hsin et al., 2016) reverts to either one of these distinctions. At the core of these models are overlapping theories, notably the Principle of Least Effort, also known as Zip's law of 1949 (Case, 2005), and Mellon's theory of Library Anxiety developed in 1986 (Katopol, 2005). These two theories situate the library in a negative perspective.

Zip's lawhinges on user preference on convenience and accessibility, over quality of information (Bates,2010). This manifests to the effort required to search through library stacks, unfamiliar online catalogues, and/or multi-platforms of different databases. Earlier research on Google versus library databases has demonstrated its convenience rather than its effectiveness making Google popular (Rowlands et al., 2008; Georgas, 2013).

The library anxiety theory, expanded by Bostick (1993) using quantitative methodologies, consist of a five-dimension scale of library anxiety: barriers with staff, affective barriers, comfort with the library, knowledge of the library, and mechanical barriers. According

to Van Kampen-Breit and Cooke (2015), existing findings on library research studies hardly report on user dissatisfaction with the library services, but rather on the expectation for more full-text online resources inferring the need for the services without the personal barrier. The preference of online, over physical, interaction with library staff was highlighted in Catalano's (2013) review stating that distance learning students were more likely to consult a librarian than their counterparts studying on campus.

There is no evidence of similar investigation on faculty library usage. Nonetheless, Nicholas and Clark (2015) drawing from their research on the Google generation, through analytics of visitor behaviour to online sources and interviewing researchers, state that academic researchers generally mention libraries in a "negative nostalgic fashion, if mentioned at all"(p. 31).This discourse further supported by Van Kampen-Breit and Cooke (2015) infers an implicit hesitation by users in asking for help of library staff lest the user be judged as incompetent. As Gremmels (2015) outlines, confirmation of this earlier palpable but unnamed phenomenon assisted many academic libraries to address it by reshaping their approach to service delivery. Adopting e-collection strategy from the earlier print-based collection, replacement of the traditional library catalogue with discovery tools (Wells, 2016; 2021), and unlimited 24-hour access to libraries (Thomas & Johnson, 2015) are some such measures.

Information divide and digital divide are concepts on the dichotomy of access to information and information communication technologies (ICTs) across different population groups within a country or also across countries (Haider & Bawden, 2007). While initial research into these areas attempted to address services for disadvantaged sections of the societies identified as information poor (Yu et al., 2016 citing Le Donne, 1977), Kagan (2000) used 'information rich and poor' to address diverse economies indicating that poor countries lacked the ability to provide acceptable level of access to information to their citizenry and thereby increasing the knowledge gap. Yu et al.'s (2016) research on the information divide highlight that even though these concepts have been investigated since 1970s, the distinction of information rich and poor had lacked a systematic measurement, resulting in often identifying the socio-economic rich as information rich.

The traditional focus on the disparities between infrastructural accesses has been merged with the know-how of the technologies (Barzilai-Nahon, 2006).ICTs and the online environment including search engines such as Google, and the increased repositories of knowledge from academic institutions is believed to reduce digital divide (Obeidat & Genoni, 2010; Nicholas & Clark, 2015).

Information behaviour especially on Google and library use, has been investigated widely from a developed country perspective (e.g., Fast & Campbell, 2004; Griffiths & Brophy, 2005; Rowlands et al., 2008; Hillis et al., 2012; Jamali& Asadi, 2010; Georges, 2013; De Groote et al., 2014). However, similar studies of developing countries, that has limited access to scholarly literature, are scarce (e.g., Malik & Mahmood, 2009; Pareek and Rana, 2013; Sycz-Opon, 2017). Likewise, the information seeking behaviour of the Maldivian academic community has not been systemically studied before; and there is no comparative data of academic information seeking behaviour across diverse economies with different levels of access to information sources.

This paper explores the information seeking behaviour of two academic communities that can be considered information rich (Australia) vs information poor (Maldives). The next section carries an overview of these selected cases of academic communities, which will be followed by the description of the research approach.

Background to the Study

The Maldives National University (MNU), formerly the Maldives College of Higher Education established in 1998 and alleviated to university status in 2011, is the first state-owned university in the Maldives (World Bank, 2011). The MNU operates as a teaching university with a recent focus on research. Higher degree by research (HDR) at MNU commenced in 2014 and a systematic research grants scheme was initiated the same year (MNU, 2014).

Curtin University of Australia, established in 1966 as the Western Australian Institute of Technology was elevated to university status in 1986 (Hart, 2014), and with the increasing recognition for its research and innovation it is ranked among the top universities in Australia (Lim, 2016).

Table 1 provides an overview of student enrolment and staff capacity of both the universities at the time of initiation of this study. The student population in 2015 at Curtin was 50,664 and 2,300 at MNU; and there were 1,755 academic staff employed at Curtin with 60% of them involved in research. The research intensity of Curtin, in comparison to MNU, can be seen in the difference in number of research staff as well as postgraduate research students.

Table 6*:* Staff and Student Statistics Collated from the MNU (2014, 2015) Annual Reports and Curtin University Annual Report (2015)

		MNU		Curtin	
		2014	**2015**	**2014**	**2015**
Student enrolment	Total student enrolments	3,189	3,30	50,800	50,664
	Attendance: full-time ratio	*	*	68%	69%
	International students on campus	0	0	8,656	8,733
	Online Students **	6%	7%	5%	6%
Level of enrolled courses	Postgraduate research	2	0	2,396	2,457
	Postgraduate Coursework	341	333	8,579	8,485
	Undergraduate	2,846	2,96	39,825	39,722
	Non-Award (Certificate, Diploma)	4,088	4,31	3,814	3,923
Staff (full-time equivalent)	Teaching	212	234	613	705
	Research	-	-	361	426
	Teaching and Research	-	-	720	624
Notes:	** The statistics does not show the proportion of part-time students* *** Curtin students identify as online students. MNU (distance education) students, study on blended-mode, with a mix of online and physical classes.*				

Table 2 summarises the library capacity at both the universities. The last published data about the MNU Library (Riyaz, 2013) shows an estimate of 100,000 books and subscription to 3 suites of scholarly databases, EBSCO, HINARI, and LexisNexis professional. At the time of data collection these different databases and the Online Public Access Catalogue (OPAC) were searchable separately in the absence of a federated search platform.

Table 7: An Overview of both Libraries

	MNU Library	Curtin Library
Book collection	Approximately 100,000	Approximately 1,073,277
Journal Databases	3 suites of databases	300+ databases
Estimated annual collection	AUD 81,429.00	AUD 4,712,000.00
Library catalogue	OPAC	Discovery tool
Access to online collections	4 different logins credentials	One login credential
Library branches	4 urban, 3 rural	1 main, 3 remote

(Adam, 2012; Riyaz, 2013; Curtin University Annual Report, 2015, and Wells and Sallenbach, 2015)

From a small island developing state's perspective, the expenditure for the MNU Library collection is significant (see Table 2). Nonetheless, as evidenced in Navarro and Shareef's (2011) analysis, this is not enough to meet the needs of the academic community.

Interestingly, these resources that are available at great costs are underused, with 60% of the library visitors never having used the databases (Mohamed, 2010). There is no other literature on information behaviour of Maldivian academic community to further corroborate the underlying reasons for the above.

The Curtin University Annual Report (2015) highlights their Library received almost 2 million students and staff visits in 2015,an increase of 19%from 2014. This negates the common rhetoric that the library as a physical space is diminishing. Curtin Library data (Table 2) shows the comparative strength of the library collection compared to MNU. As reported by Wells and Sallenbach (2015) changes were necessary for the Library to stay relevant in the ubiquitous online environment, accordingly, initiated electronic journal subscriptions in the mid-1990s and by the year 2014 its physical journal subscriptions were at 0.2% of the estimated serial collection of 165,006. Similarly, the Library has an 'e-preferred' model of collection development even for books. Their 2014 statistics summarises the book collection at 1,073,277 titles with 521,290 titles available in print and the rest on different electronic mode of access. Curtin Library did away with the traditional OPAC in the early 2000s in favour of federated searching that facilitated single click searches across multiple databases; and in 2009 the Library implemented a discovery system providing users with a seamless search across the Library's print and eBooks, journal databases, and other online collections (Wells, 2016).

In summary, MNU mostly operates as a teaching university newly embarking on research, with limited access to information resources, while Curtin University is research intensive and enjoys access to a vast range of information resources through their library.

Research Design

A mixed methods research approach, using interviews and a quantitative survey, was utilised to study the diverse academic community's information behaviour. Given there is sufficient literature addressing information seeking behaviour from developed country context as outlined in the literature review earlier, in-depth interviews were conducted only for the Maldives case. A quantitative survey questionnaire was developed using existing literature and supplemented with the findings from the interviews.

The two countries and the universities were selected through purposive sampling approach. MNU was selected as a representative case of a developing country, mainly because of the affiliation of the researcher to the MNU library management. Curtin University, Australia, was selected as a representative university in a developed country given the affiliation of both researchers to the university, therefore positioned to assess the suitability of

Curtin's library services as highly advanced. Australia is ranked number two in the Human Development Index of 2016, while Maldives is ranked 105 out of 188 countries (UNDP, 2016). Data was collected with the Curtin University's research ethics approval, and in two phases.Firstly,13 individual in-depth interviews with the Maldivian academic community (with a purposive sample of 5 academic staff and 8 students).

Secondly, an online questionnaire, using the Qualtrics survey tool, was administered across both universities on a random sample. The survey was open for the entire MNU and Curtin community to participate within the population parameter of academic staff, postgraduate (PG) and final-year undergraduate (UG) students. The population details are in Table 1. From MNU, 56 staff and 38 (19 PG, 19 UG) students responded to the online survey; and from Curtin, 42 staff and 123 (104 PG, 19 UG) students responded. Statistically, the sample with a 6% margin of error offers 80% confidence for MNU sample and 88% confidence for Curtin sample.

The interviews were transcribed then thematically analysed using the NVivo software. The findings from the interviews informed the design of the detailed survey questionnaire. The survey data was analysed using Qualtrics' inbuilt analysis with further extrapolation of data using SPSS.

Findings

The main reporting is based on the survey carried out on both the cases studied. Findings from the interviews are presented where informed inferences can be made to understand the concepts further.

The survey demographics of staff participants across both institutions are quite similar in age and years of teaching experience, with the main differences being most MNU staff (74%) having a masters-degree versus Curtin staff (69%) with an HDR as their highest qualification; and the bulk of MNU staff teach undergraduate and non-award courses with only 2% involved with HDR students, while Curtin respondents typically teach postgraduate courses with half of them involved in HDR.

Most student respondents from both the communities study face-to-face, with one-third of MNU and Curtin students studying on blended-mode and online respectively. Half of MNU student respondents were undergraduates while most Curtin students were postgraduates. Another difference in student demographics was their prior qualification, with MNU PGs qualified with a bachelor's degree or lower, and the bulk of their UGs with no prior tertiary qualification. Contrarily, half of Curtin PGs already have another PG qualification.

Initiating Search

Participants were asked how they would normally start a search in an academic setting. Both communities (see Figure 2) use Google or internet as the initial information search platform, with slightly more reliance on it by MNU (internet search: *m*=4.4, Google *m*=4.5). For Curtin, the reliance is equally spread across the library's online collection and internet searches (*m*=4.0) with an inferred Google preference (*m*=4.1).

These findings indicate a low reliance on the physical library and lower emphasis on any contact with a librarian to start searches. However, a higher tendency to ask a librarian at MNU (*m*=2.1) is indicated than at Curtin (*m*=1.7). Similarly, MNU (*m*=2.7) relies on the physical library slightly more than the Curtin (*m*=2.3) community does. While the pattern is similar, the MNU sample display difference in how often the sources are used, with students using library sources less often than staff.

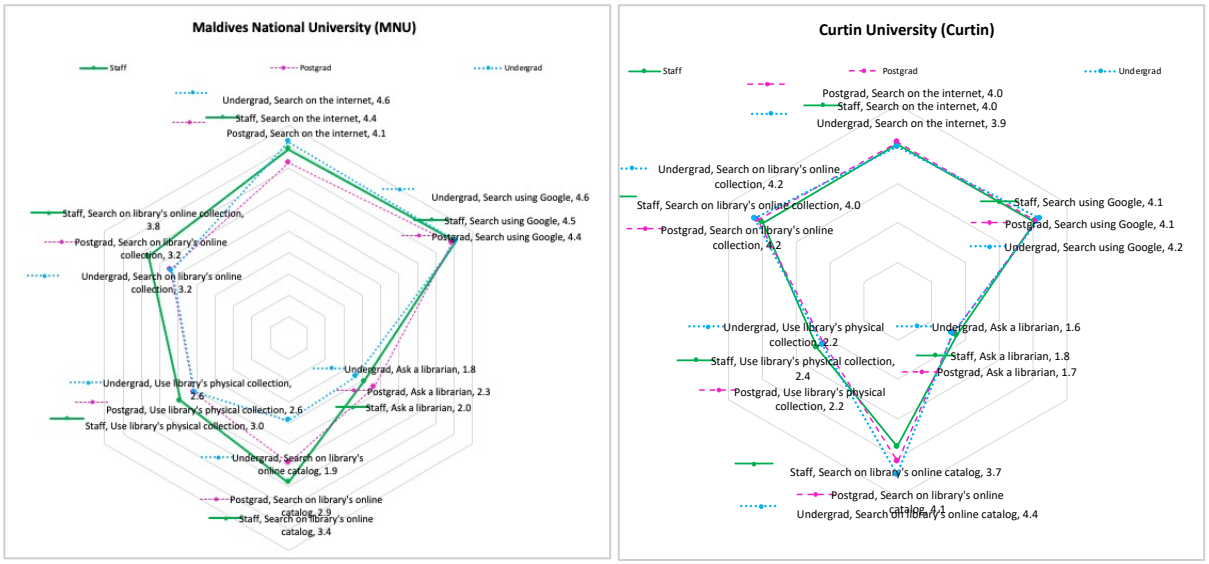

Figure 5. Initiating Information Seeking for Academic Purposes

(Data represented as the mean (m) of the scale responses 5=most often, 4=often, 3=sometimes, 2=rarely, and 1=never)

Figure 3 shows participants' primary methods in identifying the location/access point of journal articles that they wish to obtain. Although, there is significant difference across both communities in how they locate journal articles, there is not much distinction between students and staff.

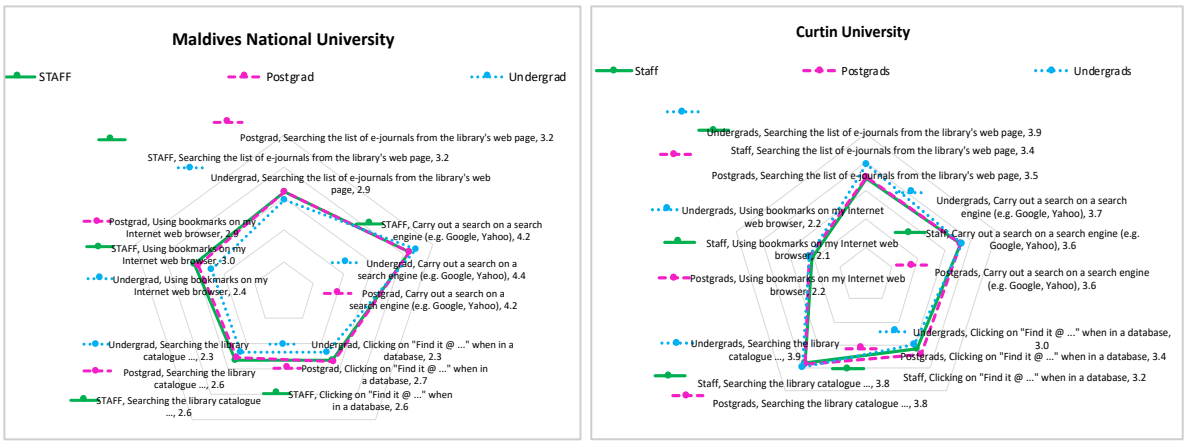

Figure 6: Primary Methods of Locating Journal Articles

(Data represented as the mean (m) of the scale responses 5=most often, 4=often, 3=sometimes, 2=rarely, and 1=never)

The main differences are: (1) MNU's high reliance on internet search engines (*m*=4.3)and low reliance on the library catalogue (*m*=2.5), whilst Curtin relies almost equally on the library (*m*=3.9) and internet searches (*m*=3.6); (2) MNU's significantly higher reliance on bookmarks on their individual web browsers (*m*=2.78), an information seeking behaviour not exhibited at Curtin; and (3) the significant popularity of using the 'find it' resolver functionality at Curtin (*m*=3.18).

The reliance on bookmarked web pages was explained by an MNU interviewee as their way of organising the content they come across while searching online. Likewise, interviewed staff members stated that they rely to a large extent on resources collected during their tertiary studies at overseas universities and had these bookmarked on web browser or collated in free online reference management tools such as Zotero.

Use of Specific Information Sources

Table 3 summarises how frequently participants use the listed information sources to find academic information. The last four columns show a cross-tabulation of their level of satisfaction with these sources.

Table 8: Frequency of use and Satisfaction with Google vs Library Databases

	Frequency of use*(%)		Satisfaction with the identified information			
			Google		Library databases **	
	MNU	Curtin	MN	Curt	MNU	Curtin
EBSCO	61	39	80	79	52	93
ProQuest	14	65	100	82	33	95
Science Direct	23	51	81	79	50	94

LexisNexis	8	4	80		100	100		83
HINARI	40	3	79		100	50		80
Science Finder	12	10	100		93	43		93
MEDLINE	23	21	71		73	43		90
JSTOR	24	37	87		83	33		93
Google	92	64	91		91	47		92
Google	81	77	85		83	50		93
Library	27	80	74		82	63		94

Note.

All figures are presented as the percentage of participants who responded to that question. *A combination of those who answered *very often* or *often* **A combination of *extremely satisfied* and *moderately satisfied* for those who selected either *very often* or *often* for each of the source on the first column.

The Google general search interface and Google Scholar were the two most popular information sources for MNU participants, followed by the use of institutional subscribed database. Conversely, the Library catalogue was cited as the most used by Curtin participants, followed closely by Google Scholar, and specific library databases. About half of the MNU participants listed 'other' sources, and these were mostly academic-social-media platforms, such as ResearchGate.com, where they can freely upload their work and access documents uploaded by others.

Contrarily to MNU, the Curtin respondents' reliance is spread across several scholarly databases and a significant number of participants listed other databases not included in the questionnaire. These include citation databases such as Web of Science and Scopus. These were not included in the questionnaire to make it as comparable across both universities given the lack of access to similar databases through MNU Library.

Notably, while MNU participants are more likely to use Google and Google Scholar compared to participants from Curtin, they are comparatively less satisfied with Google and Google Scholar. The interviews with the Maldivian community revealed that they used Google as a discovery tool with mixed expectations on what they can retrieve through Google. There was dissatisfaction that Google does not necessarily provide access to the required full-text articles. Nonetheless, the discovery of citations was taken positively. Consequently, the MNU community sought alternative ways of getting access to required articles, or they settled with an available alternative full-text article.

Among the MNU interviewees, there were perceptions that their library did not provide adequate access, or the limited access they provided was not satisfactory, given the complications of multiple logins and slow connectivity. Furthermore, a perception that the library would not be able to source the article as it did not provide document delivery or inter-library loan services was evident. Consequently, the interviewees portrayed a reliance on Google as a better information source than the MNU library. However, it was observed that the interviewees with active research or publication record placed less emphasis on Google as the only information source.

Specifics of Google Use

Table 5 presents participants' indication about their usage of the Google, Google Books, and Google Scholar. The findings show that the use of the generic search engine, Google.com, is universal across the three sample groups from MNU, with96% of the participants using it 'often'. Similarly, it is common across the Curtin community with 84% of the participants using Google.com 'often'.

Table 9: Google platforms and Satisfaction Level with the Results (Data represented as the mean (m) of the scale responses 4=often, 3=sometimes, 2=rarely, and 1=never)

	Hof often do you use these?					
Sources	**Google.com**		**Google Books**		**Google Scholar**	
	MNU	Curtin	MNU	Curtin	MNU	Curtin
Staff	3.87	3.78	3.18	2.32	3.49	3.45
Postgrad	4.00	3.73	3.18	2.36	3.12	3.42
Undergrad	4.00	3.89	2.75	2.22	3.19	3.44
TOTAL	**3.96**	**3.80**	**3.04**	**2.30**	**3.26**	**3.44**

Whilst the reason for the high use ofGoogle.com was not ascertained in the survey, the interviewees clarified that the purpose was quite often to find something usable around the topic."[From Google] you can get a lot of information … on a variety of topics. Sometimes, an exact match might not be found. But there will be many related contents. Or at least shows other pathways that can be followed" (PG1). Even if there is a restriction [of access] to a journal - many [authors] have other versions shared online" (Staff2).

Compared to Google.com, the use of Google Books is relatively low by both communities, although it is higher by the MNU community in comparison. Google Books is more popular with staff and postgraduates than undergraduates.

Google Scholar is frequently used, more so by Curtin (m=3.44) compared to MNU(m=3.26). From the interviews, it can be inferred that the Google Scholar search platform is perceived equivalent to self-contained traditional journal databases. "At first on Google, I do a general search - from there I try to identify readings of interest… But then every link doesn't have the full text in Google scholar" (Staff 5).

The interview data also shows that some users are not aware of Google Scholar. They start with Google.com, and a link on a retrieved result could take them to Google Scholar or Google Books and not everyone makes this distinction.

Online Search Strategy

To explore participants' search behaviour, they were asked what keywords and search functionalities they use when seeking information for academic purposes. The main online search strategy used by both communities are 'main words from the assignment or research topic at hand' (Figure 4). There are slight variations within the MNU groups with the rest of the search strategies. Conversely, the three groups from Curtin demonstrate an almost uniform search approach.

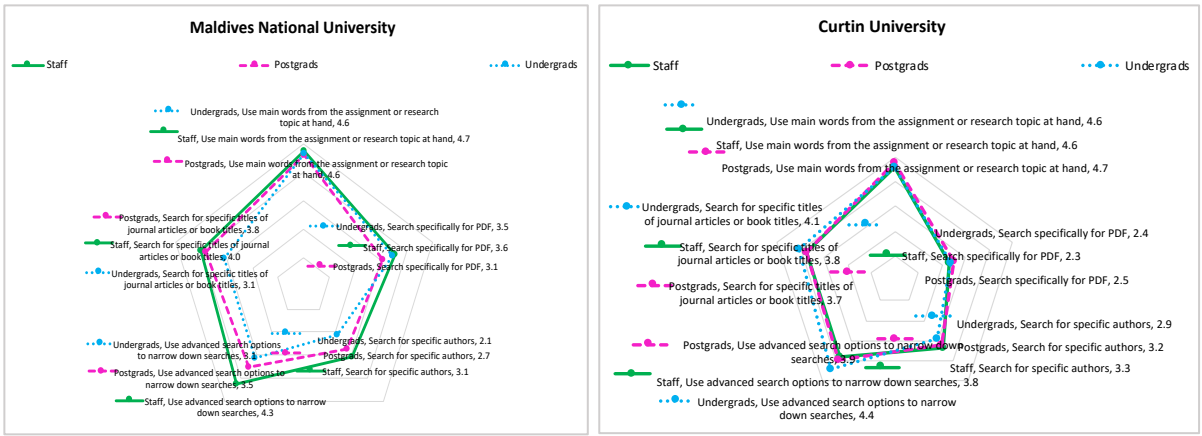

Figure 7: Strategy Utilised to Phrase Search Terms (Data represented as the mean (m) of the scale responses 5=most often, 4=often, 3=sometimes, 2=rarely, and 1=never)

The second common search behaviour observed is to search for specific words in titles of journal articles or books. However, MNU undergraduates seldom search for article or book titles. Search for specific authors is also least among this group.

Another online search behaviour peculiar to the MNU is to specifically search for files in the portable document format (PDF) (MNU *m*=3.4, Curtin *m*=2.4). The interview data reveals this is not just a matter of selecting PDF output from the retrieved results, but specifically stating 'PDF' as part of the search term. The interviews also infer that PDF reading material were often incorrectly associated to quality. "Usually, I try to find PDF files… PDF files are most often copyrighted material. That's why I depend on it" (UG1).

Another observed distinct search behaviour is the higher use of advance search options by the Curtin community, while this practice appears to be similar with the MNU staff participants only, with relatively low use of advance search strategy by MNU students. While the reasons for these were not ascertained through the survey, the interviews with the Maldivian academic community highlighted the lack or shortage of information literacy training.

Effort Exerted in Searching Online

Participants were asked how many search-result pages they browsed for each Google search. The responses from across the two communities are quite similar (Figure 5), with slightly more MNU participants (*m*=4.1) compared to Curtin (*m*=3.8) stating that 'the first page usually contains reliable links. More Curtin participants (*m*=4.0) compared to MNU (*m*=3.7) stated they usually browse through about 3 pages. A large proportion of the participants indicated that they browse through as many search result pages as required until they got useful information (MNU *m*=3.5, Curtin *m*=3.4).

There are slight variations between the three sample groups surveyed but notably from MNU, with considerably more undergraduates settling with the search results displayed on the first page and hardly going beyond page three of the results.

These findings from the MNU and Curtin academic communities are discussed in the next section using the major themes from Knight and Spink's (2008) information behaviour model (Figure 1) and addresses the research objectives of conceptualising the information seeking behaviour within the context of the googling phenomenon and outlines the similarities and differences across the two country cases used for this study.

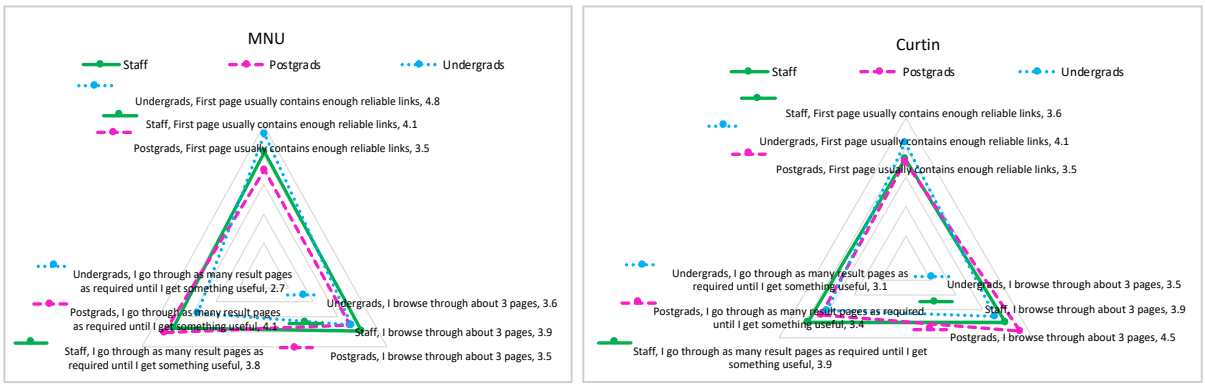

Figure 8: Number of Pages Browsed from Online Retrieved Search Results *(Data represented as the mean (m) of the scale responses 5=most often, 4=often, 3=sometimes, 2=rarely, and 1=never)*

Discussion

Browsing, Navigating Interactions, and Query Formulations

Query formulation is part of the process of browsing and navigating through the sources in the users' information seeking process. In the information behaviour literature, activities in the initial search for information carried out to form an understanding of the topic under review, are referred to as 'starting' (Ellis, 2005). This concept is integrated into Knight and Spink's (2008) model within its 'information seeking behaviour' strategies.

As seen in the findings, users gather a general understanding on the topic they are investigating by *googling* for the topic, whereby, Google is the starting information source for their academic information seeking. This is reflective of existing research that highlight the user preference for googling when commencing a new topic or search (Burns, 2014; D'Couto & Rosenhan, 2015; Haglund & Olsson, 2008; Hsin et al., 2016).The findings also indicate users generally start search on the Google general search interface, which seamlessly takes them to Google Scholar and Google Books. The interviews with Maldives sample show some users appear unaware of this transition.

This starting of a search is initiated through simple query formulations. The survey data indicates that users opt to use words/phrases from their research topic instead of formulating systematic search terms. The interview data offers evidence that users repeat this simple keyword searching for their research topic by continuously refining the terms depending on the results retrieved. Haglund and Olsson (2008) referred to this approach as "trial and error" search methodology (p. 55) because it is not well thought out.

The keyword-based enquiries, as opposed to the utilisation of subject categories or advanced searching, has been criticised by some scholars. Hillis et al. (2013) claim that Google's algorithms that use the searchers' earlier search history, results in "individuated truthiness…[and] limits the capacity to generate an overview of the subject area" (p. 159).

On the contrary, the participants believe a Google search offers them a better overview of the subject area than a library catalogue search does. The interview findings imply users do not have high expectations of obtaining precise 'hits' when they start a search on Google for academic purposes. However, they believe a Google search will help them to discover what is available and, in the process, help them refine their search terms. This concept of continuous refinement can be equated to Vakkari's (2016) preposition of searching as a learning outcome. Furthermore, the interview findings show that advanced search options are hardly used by the MNU participants, with several staff explicitly stating that they do understand advanced search options but are often satisfied with keyword searching. The survey findings show that while their main search strategy too is simple keywords, Curtin participants do utilise advanced search options. Given the research is not observational, it cannot ascertain the actual search behaviour. Earlier observational studies around this issue, for example Haglund and Olsson (2008), reported that advanced searching was seldom observed from the researchers in their investigation, and when used it was often unsuccessful. Likewise, Dalal et al. (2015) reported that while undergraduates and postgraduates in their experimental research were somewhat aware of Boolean searching, they failed to use it effectively even when used.

User Judgements and Tactics in Information Retrieval

Further search behaviour on retrieved results can be equated to the variables presented at levels two and three on Knight and Spinks's (2008) theoretical model. Based on the findings, it is believed that the system feedback, user judgements and user tactics are all intertwined, and therefore they are discussed together.

The findings reveal that users determine the quality of online information by assessing whether the retrieved results meet their criteria for the search topic. These findings align with Case's (2006) observation that information seeking is mostly influenced by the need and not by the notion of information. The conventional quality judgements such as journal impact factor, reputation of the publisher, journal title, or author are given only 'somewhat importance'.

Another finding was the value placed on the portable document format (PDF) for article selection. Dalal et al. (2015) highlighted that the students in their investigation expressed

displeasure when the library discovery tool failed to link their search results to PDF files. Similarly, the survey participants from the Maldives confirmed they use a search strategy that seeks PDF file formats. Curtin participants did not report the same degree of use of this search strategy. Nonetheless, the participants from both universities cited the availability of a PDF as an important criterion when selecting an article to read, and some participants stated PDF as an indication of credibility of the content.

The reasoning for the preference of PDF files was not addressed explicitly in the survey but can be inferred. Mizrachi (2015) reporting on undergraduate students reading patterns, revealed students preferred the flexibility offered by PDF when considering the cost of printing coupled with portability. Head and Eisenberg (2009) reported that undergraduate students often failed to use appropriate criteria in assessing the scholarly nature of literature. The findings of this research are significant because the implied perception is not only limited to MNU undergraduates, but also to some academic staff.

Similar superficial judgements in their evaluation of quality and reliability of articles can lead to an unrealistic over-simplification of the online search process, and a high dependency on the relevance ranking of search engines to determine reliability (Asher et al., 2013). Caulfield (2005) reported that with the increase of online resources, the challenge for the user is not the lack of access to literature but is more about intellectual access, which indicates more vigilance by the users in determining the authenticity of online resource, than when retrieving resources from journal databases.

Convenience and Least Effort

Ease of use and convenience are popular explanations for the use of information sources. Connoway et al. (2011) explained that if access to information was not convenient, the user would rather look for an alternative. The findings reported in this paper support this notion. When asked for reasons why the participants conduct their search on Google, over 75% of the survey participants affirmed the preference of convenience. The interviews with the MNU highlighted the time factor; some participants cited their comparatively hectic schedule that warrants quick access to ‘good-enough’ resources.

From a developed country context, the preference of convenience has been explained from the digital natives’ perspective, where those born into the net-generation have high dependence on the internet with the ‘right-now-access’ mentality (Judd & Kennedy, 2010; D’Couto & Rosenhan, 2015). It can be argued that this is true even in the Maldives’ context given its ICT-savvy population with universal access to the internet and mobile telephony

(Riyaz & Smith, 2012). Equipped with ubiquitous internet access and continuous exposure to a one-stop search experience, user behaviour is shaped to expect immediate gratification even in academic information seeking.

These findings highlight convenience is an important determinant in information seeking, and validates Zipf's principle of least effort (Brophy & Bawden, 2005; Case, 2005) as an explanation of the preference for one-stop online search engines rather than using library catalogues that have limited discoverability of resources.

Google vs the Library as an Information Source

The survey findings from the Maldives and Australia report Google as the preferred intermediary between the user and information, irrespective of whether the affiliated library is well-resourced or not. The high use of Google search engine is not necessarily because of a lack of resources from their affiliated academic libraries. Nonetheless, the low use of the library has relevance to its inadequacies in being able to meet users' information needs.

The disconnect of the databases, the protracted registration process, and the consequent effort required, were cited by the interview participants from MNU as reasons for the limited use of library databases and the library catalogue. Similar observations were also reported by Van Kampen-Breit and Cooke (2015). The same perceptions were also observed from the survey participants. The interview participants, who used the library databases, specifically at MNU, confirmed that there was a satisfactory level of access to scholarly publications through the library, if one had the patience to search through the databases individually.

On the other hand, the Curtin Library catalogue provides a single search gateway to their library's extensive collection of scholarly databases, their monograph collection, together with Google Scholar. This is facilitated through their online library catalogue that embeds a discovery tool (Wells, 2016), and explains why the library catalogue is the most popular information source for Curtin participants. While the use of Google general search is not as high in comparison to MNU participants, a significant proportion of Curtin participants (64%) do use it. These findings are similar to other comparative studies. For example, De Groote et al. (2014), in their investigation of the information seeking behaviour of academics at the University of Illinois, reported that apart from the use of the MEDLINE™ database, the most often used information source was Google and Google Scholar.

While Google is the starting point of information seeking for both the information-poor and the information-rich cases studied, Google is not the preferred search platform for specific searches by the Curtin academic community. More Curtin participants use their online library

catalogue more often to search for specific journal articles. This practice is contrastingly low for the MNU participants who are highly reliant on Google even to source full-text of journal articles. It is not surprising given the limitations of financial and other resources in the Maldives libraries (Riyaz & Smith, 2012).Given this void, it is natural that the Maldives academic community choose to rely on the freely available alternatives through Google search interfaces. These can be further clarified by Connaway et al.'s (2011) explanation of convenience as a 'situational criterion', where information needs and how information is sought is reliant on information availability and accessibility.

These findings confirm prior research that reports academic information seeking is centred heavily on online information sources sought specifically via Google (e.g., Fast & Campbell, 2004; Griffiths & Brophy, 2005; Miller & Pellen, 2009; Jamali & Asadi, 2010; Nicholas & Clark, 2015). These can be attributed to the increase in online resources through open access publishing modalities and/or through the prominence of academic social media sites such as ResearchGate (Nicholas & Clark, 2015). As reported by Jamali and Nabavi (2015), based on their experimental research, 60% of search results retrieved through Google Scholar contained online full-text articles, indicating users would have to resort to other alternative means of access including going through a library or pay for access for the remaining 40% of articles. The findings from this research infer that users, especially from the Maldives, increasingly forgo the library and settle for alternative sources of articles that are easily and freely accessible online which could have implications on the quality of scholarly resources accessed.

The findings reveal that the participants from the Maldives academic community predominantly see Google as an alternative to the library while most Curtin participants see Google as a supplement, with *googling* as a useful start to information seeking in both communities. These can be explained with the value-added role of the respective library that sources the full-text content linked between the Google search to the Curtin University discovery tool through its 'find-it' resolvers.

Limitations of the Research

While Curtin University is an advanced institution in a developed country, 33% of the student population is made up of international students from developing countries, mostly from China, Malaysia, India, and Indonesia. Therefore, this might present limitations in situating user behaviour to the country context. Additionally, it is acknowledged that the response rate

of students especially, from both universities is low. While the sample size may be sufficient for an exploratory study it is not adequate to generalise the results across the communities.

Conclusions

The findings reveal no significant difference in the approach to information seeking between the two sample universities in terms of how information searching is initiated. Irrespective of information rich or poor entities or counties, Google and Google Scholar are among the top two most often utilised information sources. A significant finding is that the satisfaction with Google and Google Scholar is higher among the Curtin community compared to a very low satisfaction by the MNU community. The differences can be attributed to the availability of and accessibility to information resources: with Curtin Library (from an information-rich country) offering superior information resources and access; and Maldivian community (as an information-poor country) relying to a larger degree on full-text resources available freely on the internet, predominantly through academic social media platforms such as ResearchGate.com. Thereby, implying libraries in developed countries add value to Google searches through their subscriptions to a wide coverage of scholarly databases and more importantly by embedding Google's search engine to their library catalogues.

An observation worth exploring further is the inferences of Google and Google Scholar as self-contained databases when both are in fact discovery tools for internet content. Furthermore, the association of quality and reliability of document just by its virtue of file format warrants further exploration especially from an information literacy perspective. The findings also caution the precarious status of academic libraries in developing countries such as the Maldives, given the mismatch in their service provision to the information need and how information is sought by their academic community, and warrants further work to strengthen academic libraries in the country. While ease of access and least effort explains the popularity of Google, this does not diminish the importance of libraries especially in fulfilling full-text access requirements for closed-access scholarly information.

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FROM DESKTOP TO MOBILE VIEW: CHALLENGES OF ACCESSING THE WEB INFORMATION VIA MOBILE DEVICES

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Abstract: One of the most conspicuous trends of today's world is the colossal upsurge in the digital native, they are highly adapted to mobile devices. With this advancement, there is a widespread worry that discussions around the development of websites have shifted from content optimized for desktop viewing to mobile viewing. This study intends to explore the challenges which are faced by the digital natives when discovering academic web information via their mobile devices, and the considered user community of Southern Campus, KDU which implemented a number of initiatives to provide the existing web services (navigation links) via the main library website. Necessary information was collected from a structured questionnaire survey. As per the findings, most users (mode 91%) accessed the websites via their mobile devices during their busy campus life. Smartphones were used by 80% of users out of the 91% of users who access web information. Against this backdrop, 81% of respondents out of 91% of users reported that they faced major challenges in the discovery of important web content, slow loading, navigation, and locating web information on their mobile devices. Current research strongly recommended to re-formatting the existing web services of desktop websites to generate mobile-friendly counterpart websites according to predefined layouts optimized for mobile devices.

Keywords: *Digital native, Mobile devices, Desktop websites, Mobile websites*

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Introduction

The current generation in the world has grown up in the digital age, the term digital native describes a young person who has grown up in the digital age, in close contact with computer devices and the internet to find the information necessary to achieve success in their academic, professional, and personal life. The term is often used by current undergraduates who ranged from 10 to 25 years old (Generation Z) and school students who ranged from zero to 10 years old (Generation Alpha) in the world. Both generations add up to compose the millennials. Since the increase of mobile technologies, digital natives are highly adapted to mobile devices such as smartphones and tablets instead of desktop or laptop screens, to cater to their busy life.

According to Okeleke (2019), 5.13 billion people become mobile Internet subscribers around the world. Further Okeleke predicts, some 165 million new mobile subscribers will emerge from the region of Sub-Saharan Africa only by 2025. Therefore that will be closer to the increasing number of individuals who make use of mobile devices.

In this advancement, the most available websites are used by the digital native, developed on the desktop version, and designed for viewing on desktops or laptop screens. Previous research highlighted a widespread worry that discussions around the development of websites have shifted from content optimized for desktop viewing only to content also optimized for mobile. Only 7% of African federal websites are mobile-friendly, which means that the African Governments are not able to fully connect with their citizens. Therefore, they are also temporized, which is essential to create websites that are customized for mobile screens (Verkijika and Wet, 2018).

Websites consist of linked pages, which are accessed by URLs on the Internet using a web browser application. Desktop websites (Full Sites) are the most common and oldest form of websites. People are intended for desktop devices by default, which is not mobile friendly as Burke (2019) people are accessed with a large video monitor of laptops or home desktop computers (Maurer et al.,2010). Furthermore, Burke, (2016) explains existing designs of desktop websites as a "development technique that are not detects the client types (several mobile devices) and not dynamically adjusts the layout of a site according to the size of the screen on which it is displayed". Since the content may be presented that users are confused.

Developing websites is, however, a complex, costly and time-consuming process, therefore, any alternative to reduce the cost of website development to help in the rapid deployment of mobile versions of websites (Benedikt et al., 2002; Stevens et al., 2008). As solutions, Jogoo et al. (2019) presented the method of opensource software and website conversion tool are

privileged to keep any cost involved in converting desktop versions to mobile versions at a minimum.

As per Jogoo et al. (2019) findings, there are open-source software and website conversion tool (cost cutting) which are available online for free that can be easily applied for formatting websites in converting desktop versions to mobile versions.

Itis observed that the increase in undergraduate interaction on mobile devices has to be further expanded the web-based library services among the user community of Sri Lankan academic libraries. The concept would help to further increase the user communities of academic libraries nevertheless the research area is not investigated in-depth in Sri Lanka. The research aims to fulfill the gap in the research literature.

Scope and Limitations of the Study

The scope of the current study is limited to examining the use of mobile devices by the user community at the southern campus, KDU to fulfill the information needs which are required for teaching, learning and research works. The scope is further limited to the websites which implemented a number of initiatives to provide the existing services of academic websites (navigation links) via the main library website to fulfill the information needs.

Significance of the Study

The study is significant as the findings would help libraries to understand draw backs of their available web services of the user interaction and strategies for reformatting the existing desktop website contents to generate mobile-friendly counterpart websites according to predefined layouts optimized for mobile devices. Libraries would be able to further expand their web services by utilizing reformatted mobile-friendly counterpart websites.

Objectives

The study explores the use of mobile devices by digital natives to discover web information, which implemented a number of initiatives to provide the existing services of academic websites (navigation links) via the main library website to fulfill the undergraduates' information needs such as eBooks, e-Journals, proceedings, conferences, magazines, etc.

- To identify the academic websites which often accessed by digital natives to fulfill their academic needs via mobile devices.
- To understand the major challenges when discovering important websites by undergraduates using their mobile devices.

- To identify the possibility of re-formatting the existing academic desktop website contents to generate mobile-friendly counterpart websites according to predefined layouts optimized for mobile devices.

Methodology

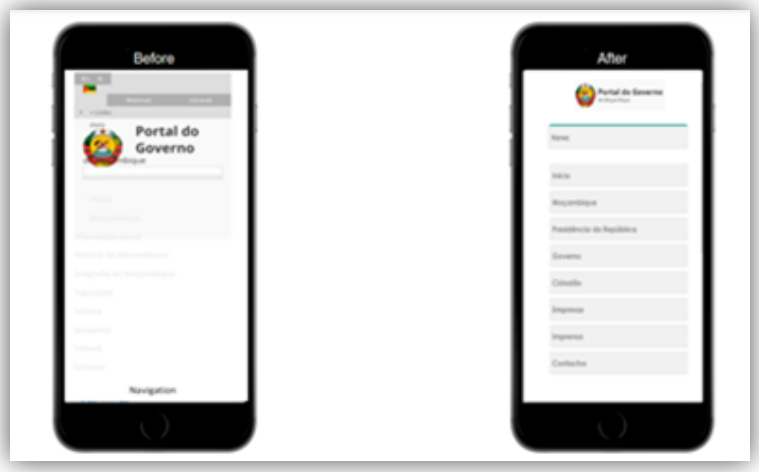
Initially, the study intended to observe the available web services and their appearance on mobile devices associated with Okereke's mobile-friendly website formatting concept and outcomes. This paper follows the descriptive survey method with a quantitative approach to examine the use of mobile devices by digital natives to discover web information and that confederated on undergraduates of Southern Campus, KDU. The total number of undergraduates in the southern campus in 2022 was 752, all of which consisted of a sample. The study was mainly focused that implementing web information services (navigation links and web interfaces) by the KDU via their main library website, those are mainly followed under three groups; a) subscribed databases by the library of KDU, b) intuitional repositories and c) others which are freely available websites related to undergraduate education at KDU.

A structured google questionnaire survey was used to collect necessary information as a data collection tool and that was designed, to cover the main research objective of assessing to extend the facilities for use of mobile devices by the digital natives to discover web information. The data collected were analyzed critically, using the Statistical Package for the Social Statists (SPSS) of version 20 descriptive statistical analyses were carried out in all instances when necessary.

Result and Discussions

KDU library network has implemented a greater number of initiatives to provide the existing web services (navigation links) via the main library website, such as E-Books & E-Journals Databases, E-Repositories, web links which are the course-related professional institutes, web links world defiance, etc.

Web developers could be applying mobile-friendly website formatting methods (cost cutting) which were introduced by Jogoo et al. (2019) to formatting the initial websites if it explains the design as a "development technique that automatically adjusts the layout of a site according to the size of the screen on which it is displayed" and there are differences between the outcomes of the desktop screen appearance and mobile screen appearance. The outcomes and positive results could be easily understood in the following images (Figure 01, 02 & 03).



Desktop version Mobile Version

Figure 1: Viewing the mobile friendly website

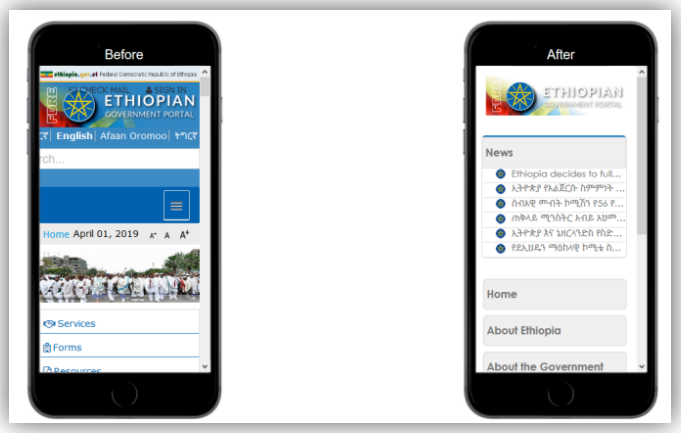
Mozambique Government Portal Before and after mobile conversion

Desktop Version Mobile Version

Figure 2: Viewing the Mobile Friendly Website

Republic of Senegal Portal before and after mobile conversion

Self-observation on a smartphone found that the majority of websites that were considered in the current study do not have to follow mobile-friendly web development methods. Those appeared only as the desktop version on a mobile screen. Responsive website design and the adaptive website design are followed by some websites it was rarely.



Desktop version Mobile Version

Figure 3: Viewing the Mobile Friendly Website

Ethiopian Government Portal before and after mobile conversion

As per the questionnaire survey findings, the majority of users (mode 91%) accessed the websites via their mobile devices during their busy campus life. Out of 725 google questionnaires, the response rate from the undergraduates of Southern Campus, KDU was 96%.

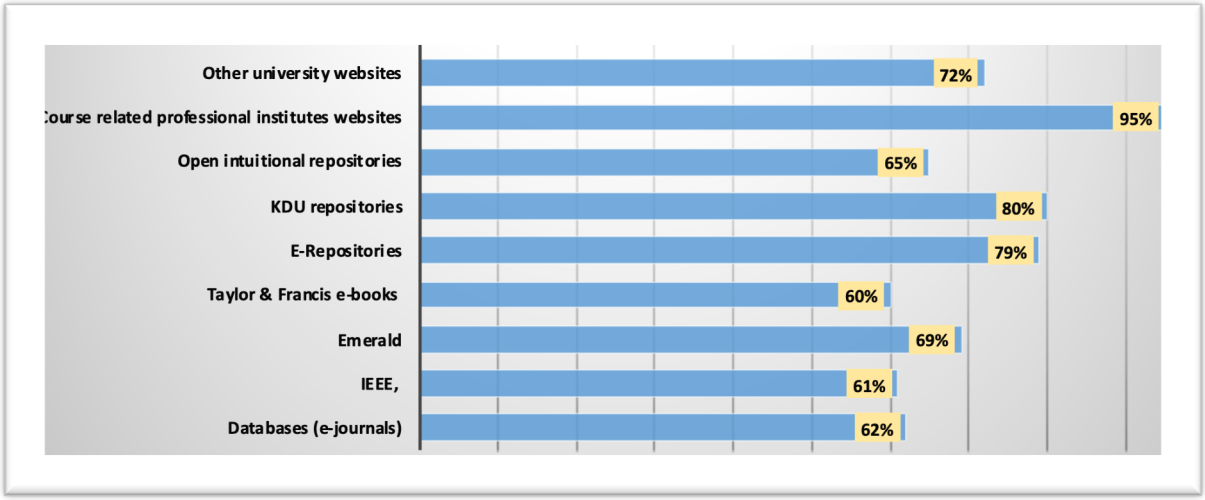


Figure 4: Percentages of the Total Respondents

62% of users reported they frequently accessed the e-journals of IEEE, Emerald Inside, and Taylor & Francis e-books databases which were subscribed from the KDU. Weblinks of repositories are used by 79% of users and 95% of users reported they accessed web links of course-related professional institutes. 72% of users indicated that they access on other university websites via the main library website of KDU to get some surface information. The majority of users (mean 67%) out of 75% are accessing via their mobile devices daily to find

the needed web information. Smartphones were used by 80% of users out of the total respondents to access web information. Burke (2019) explains in his study responsive design is a "development technique that detects the client type and dynamically adjusts the layout of a site according to the size of the screen on which it is displayed". Therefore, the exact content may be presented in a "three-column format on a desktop", "two column formats on a tablet", and "one-column format on a smartphone" (Burke, 2019). According to Burke that can recognize the connection between available options of the mobile devices and properly optimized websites to the mobile screens. Against this backdrop, 81% of respondents reported that they faced major challenges in the discovery of important web content, slow loading, navigation, and locating web information on their mobile devices

Conclusions

Since the increase in mobile technologies, undergraduates are highly adapted to mobile devices such as smartphones and tablets instead of desktop or laptop screens to fulfilling their academic information needs. It provides users with subscribed valuable information via several appropriate websites. However, current research explores that the majority of websites which implemented a number of initiatives to provide the existing services of academic websites (navigation links) via the main library website do not have to follow mobile-friendly web development methods. Therefore, they worry that the more difficulties weaving the desktop websites on mobile screens, that identify the possibility of re-formatting the existing academic desktop website contents to generate mobile-friendly counterpart websites according to predefined layouts optimized for mobile devices; mobile phones, and tables.

Suggestions and Recommendations

The study intended to identify the real situation of undergraduates' interaction with the use of mobile devices to discover online library services. As per the current study findings, undergraduates highly interacted with online library services to discover web information via their mobile devices. Against this backdrop, undergraduates faced more challenges when they were accessing web information such as the discovery of important web content, slow loading, navigation, and timely locating the web information using their mobile devices. User communities of academic libraries would be further expanded on online library services that are required to reformat the existing web services using a mobile-friendly method to optimize for mobile devices. Therefore, the current study strongly recommends reformatting the existing websites and suggests to use of open-source software and website conversion tool which was

introduced by Jogoo et al. (2019). It provides the privileged to keep any cost involved in converting desktop versions to mobile versions

Future Research Implications

The study proposed as future research implications, ITC based technical research study on how to reformat the existing desktop websites of web services to generate mobile-friendly counterpart websites according to predefined layouts optimized for mobile devices using the open source software and website conversion tool.

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INDIAN INSTITUTES OF TECHNOLOGY (IITS): WEB-EVALUATION AND RANKING

Aman Verma[1] and Babita Jaiswal[2]

Abstract

The study aims to analyze the web content available on the websites of selected IITs and compared the rank obtained by these IITs based on the content and WISER ranking. The correlation between both the rankings tells us about the order of direction of both the rankings. The data is collected individually from each website of the libraries and a list of checkpoints was made and then scored for their rankings. The data for link analysis is collected by using the query syntax and then tabulated for calculation of WISER Index value. The findings of the study reveal that the correlation between these ranks is weakly positive. The WISER Index value of IIT Delhi is 11.960, while IIT Indore and IIT Tirupati has 11.932 and 4.679 WISER Index value respectively. IIT Indore has a total of 15,50,000 web pages followed by the IIT Hyderabad with 3,62,000 web pages and IIT Tirupati has only 1,140 webpages. The study suggests that websites need to be improved so that the users may conveniently approach their needs.

Keywords: *Indian Institutes of Technology, Ranking, Websites*

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Introduction

The Indian Institutes of Technology (IITs) are a group of autonomous prestigious engineering and technology-oriented institutes of higher education established and declared as Institutes of National Importance by the Parliament of India. The IITs were established to train scientists and engineers and to develop a skilled workforce to support the economic and social development of India. These institutes play a very crucial role in imparting the knowledge to develop the skills of the vibrant and enthusiastic brains of the country studying in these institutions. On the other hand, educational institutions are heavily dependent on their websites in delivering information and thus the role of libraries comes out. Libraries need to develop their library website full of resources and fulfill users' information needs. The richness of the library on the web platform also demonstrates the richness of the library as a physical entity. Similar to the traditional function of librarians, the library website should be responsible for choosing, arranging, and making information resources accessible. The key information on any library website's strengths and weaknesses is provided by effective content analysis. So, through this paper author tried to analyze the websites of these prominent institutions and evaluate the library services rendered through their website as well as to measure the information linking pattern in their websites and then rank accordingly. The ranking of IITs will help the web developers to redesign the website in a way that it must reflect the services and resources provided by the IIT and enhances their usability.

Literature Review

Jalal (2019) analyzed the web link structure of 23 IITs' using SocSciBot4.0 and Pajek4 and also discusses the problems of search engines and their limitations in web link analysis. The data on the webpage have been collected from Google search engine using webometric query syntax and the data on visibility was collected from the Majestic SEO tool. The results show that IIT Gandhinagar has the highest number of web pages (50,500) whereas IIT Patna shows the lowest (2,830) web pages among medium IITs, but IIT Patna witnessed the highest number of backlinks (5,62,682). Consequently, IIT Patna scored the highest WIF among the new IITs. More than 90 percent of backlinks are in English language, which is the dominating language on the web followed by Hindi in the case of Indian websites.

Ghosh and Roy (2022) examined the websites of 36 NAAC-accredited general degree colleges in West Bengal. The data is collected using Google search engine using special query syntax and calculated different WIFs and WISER values of websites. The finding shows that Panihati Mahavidyalaya's website under West Bengal State University ranked first in Simple

Web Impact Factor (SWIF) with 1887.912%, and Bandipur Mahila Mahavidyalaya's websites ranked first in self-link WIF, INLWIF, and EWIF with 0.679803 SLWIF, 0.729064 ELWIFs, and 0.315271 RWIFs, respectively. The study suggested to college administrators and webmasters better comprehend the importance of these websites in making them user-friendly and informative websites that meet the needs of their users.

Shah, Sultana and Afroz (2022) explored the present status, contents, and features that are used for user communication of private university library websites (PULW) in Dhaka city, Bangladesh. The study found that the trend of websites that began a few years ago will become a driving force for library services, though it has plenty of room for improvement, such as liquid layout, mobile-friendliness, Web-OPAC, online tutorials, etc., and shows some issues for library website maintenance.

Agrawal, Kumari and Bariya (2021) analyzed the websites of the libraries of Institutes of National Importance which includes Indian Institutes of Technology (IITs), Indian Institutes of Management (IIMs), and Indian Institutes of Science Education and Research (IISERs). The study includes technological and resource-based aspects to analyse the library websites of these institutes. The findings of the study show that very few institutions provide a direct link to the library webpage through the institutional website. Most of the institutes either don't have an institutional repository or the link was not provided on the library website. IIT libraries performed better than IIM libraries and IISER libraries in respect of cumulative performance where the mean of all points gained by all IITs is 57.32% while in IISERs it was 48.14% and IIMs it was 44.3%. The study suggested that the institutions need to provide a direct link to the library on the institutional website instead of putting the link in the facilities, footer, etc. and these websites should have given the date of page update. It will add value to the website.

Gupta, Natarajan and Gulati (2022) investigated the websites of 17 Central Higher Education Institutes (HEI) in Uttar Pradesh. The data is collected from the HEI through SEO Small Tools and the Google search engine. The study resulted that majority of HEI are using “ac.in” extension only a few uses “edu.in” and “.com”. IIIT-K secured the first position in Moz rank, domain, and page authority. They suggested that HEI authorities should appoint a team for creating, designing, and updating the websites from time to time.

On the basis of the above review of literature, it was found that many studies have been conducted in India as well as abroad on different Institute’s website to measure the effectiveness and efficiencies of library website. But overall literature review shows that perhaps no study was conducted to evaluate the libraries website of IITs based on content and URL analysis together. The present study will try to fulfill the gap.

Need of the Study

The study is an attempt to examine the contents available on the library websites of selected IITs in India. Through this study, the investigators evaluate the library services rendered by the IITs through their websites as well as measure the information linking pattern on their websites. The findings of the study will be helpful for the librarians and webmasters in redesigning their library websites in a more interactive and informative way, so that the websites can serve as the most efficient and cheapest way to boost teaching and research. Keeping this perspective in mind the investigators have decided to do a content analysis of these websites.

Objectives

The objective of the study is to find out whether the content-rich websites have also good, WISER (Web Indicators for Science, Technology and Innovation Research) index value. The other objectives include:

1. To analyze the general features, and services provided by the libraries through their websites and rank them accordingly.
2. To find out the Web pages, In links, Rich files, and the number of papers and citations for each academic domain and calculate the WISER ranking.
3. To determine the correlation between WISER ranking and the ranking based on the content of the websites.

Methodology

There is a total of 23 IITs established in India, out of which the scope of the present study is limited to selected 18 IITs. The remaining five IITs do not have sufficient data about the library and does not have a dedicated library website. The list of selected IITs with their URLs of websites of libraries is presented in Table 1.

A checklist was prepared, based on some previous studies, and the content of the websites of libraries under the study was scanned thoroughly during August 2022 and then tabulated for ranking. For calculating the total number of web pages, the command **domain:** www.site.com was used. Similarly, the data for all the websites were collected. For counting the inlinks; SEO Review Tools (a link analyser tool) has been used (https://www.seoreviewtools.com/seo-checker).

Table 1: List of selected IITs

S. No.	Name of the Institutes	Abbreviation	Establishment Year	Library Website
1.	IIT Bhubaneshwar	IITBBS	2008	https://library.iitbbs.ac.in/
2.	IIT Madras	IITM	1959	https://cenlib.iitm.ac.in/
3.	IIT Guwahati	IITG	1994	http://www.iitg.ac.in/lib/
4.	IIT Indore	IITI	2009	http://library.iiti.ac.in/
5.	IIT Kanpur	IITK	1959	http://pkklib.iitk.ac.in/
6.	IIT Jodhpur	IITJ	2008	http://library.iitj.ac.in/
7.	IIT Kharagpur	IITKGP	1951	https://library.iitkgp.ac.in/
8.	IIT Hyderabad	IITH	2008	http://library.iith.ac.in/
9.	IIT Bombay	IITB	1958	https://www.library.iitb.ac.in/
10.	IIT Patna	IITP	2008	https://library.iitp.ac.in/
11.	IIT Delhi	IITD	1963	https://library.iitd.ac.in/
12.	IIT Ropar	IITRPR	2008	https://library.iitrpr.ac.in/
13.	IITMandi	IITMD	2009	http://library.iitmandi.ac.in/
14.	IITRoorkee	IITR	2001	http://mgcl.iitr.ac.in/
15.	IITBHU	IIT (BHU)	2012	https://iitbhu.ac.in/cf/lib
16.	IIT Jammu	IITJMU	2016	https://iitjammu.ac.in/library
17.	IIT Palakkad	IITPKD	2015	https://lib.iitpkd.ac.in/
18.	IITTirupati	IITTP	2015	https://iittp.ac.in/CentralLibrary/

(Government of India, 2017)

The number of file formats for each website is obtained on Google with the following strategy: **site: example.com file type**. For example: **site: www.bhu.ac.in file type: pdf** for retrieving the total number of .pdf files that website contains **Web Indicators for Science, Technology and Innovation Research (WISER) Ranking.**

Almind & Ingwersen (1997) proposed the first Web indicator, Web Impact Factor (WIF), based on link analysis that combines the number of external inlinks and the number of pages of the website, a ratio of 1:1 between visibility and size. This ratio is used for the ranking but adding two new indicators to the size component: Number of documents, measured from the number of rich files in a web domain, and the number of publications being collected by

Google Scholar database. As it has been already commented, the four indicators were obtained from the quantitative results provided by the main search engines as follows:

Size (S) - The number of pages recovered from Google.

Visibility (V) - The total number of external links received (inlinks) by a site can be only obtained from Google.

Rich Files (R) - The volume of the different file formats, the following were selected: Adobe Acrobat (.pdf), Microsoft Excel (.xls), Microsoft Word (.doc), and Microsoft PowerPoint (.ppt) and it is extracted using Google.

Scholar (Sc) - Google Scholar provides the number of papers and citations for each academic domain.

The formula for the calculation of the WISER Ranking is given below:

WISER ranking = log (Visibility 50%) + log (Size 20%) + log (Rich files 15%) + log (Scholars 15%)

Data Analysis

i. Evaluation of Content of Websites

Table 2: General Information Available on The Website

General Information	IITs																		TOTAL
	IIT BBS	IIT M	IIT G	IITI	IIT K	IITJ	IIT KGP	IIT H	IIT B	IIT P	IIT D	IIT RPR	IIT MD	IIT R	IIT(BHU)	IITJMU	IIT PKD	IIT TP	
Introduction/About us	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	17
Mission/ Vision	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	10
Library Hours	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	16
Library Rules	1	0	1	1	1	0	0	0	0	1	1	1	1	1	0	1	0	0	10
Memberships	1	0	0	0	1	0	0	1	1	1	1	1	0	1	1	1	0	0	10
Services	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	17
Collections	1	1	1	1	1	0	1	0	1	0	1	1	0	1	1	1	1	0	13
Infrastructure	0	1	1	1	1	1	0	0	1	0	1	1	1	1	1	0	0	0	11
Library Staff	1	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	15
Library Sections	0	1	1	0	1	0	1	0	0	0	0	0	0	1	1	0	1	0	07
New Arrivals	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	0	0	14
Contact Information	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	1	15
SCORE	10	09	10	09	11	03	07	05	09	08	11	11	09	12	11	10	07	03	

(Council of Indian Institute of Technology, 2022)

Table 2 presents the basic information about the library available on their websites. IIT Hyderabad does not provide information about the library whereas some IITs like IIT

Guwahati, Indore, Kanpur, Jodhpur, Kharagpur, Bombay, and Tirupati have displayed of their vision and mission of the library. Only 10 IITs provide the information of Library rules and the membership details on their website. The IIT Roorkee provides all the general information listed in the Table 2 and it scores 12. IIT Jodhpur, Kharagpur and Palakkad does not provide the contact information. The IIT Tirupati failed to provide this basic information on their website and scored only 03 that is the least score.

Table 3: Services and Resources Provided by the Libraries

Services and Resources	IITs																		TOTAL
	IIT BBS	IIT M	IIT G	IIT I	IIT K	IIT J	IIT KGP	IIT H	IIT B	IIT P	IIT D	IIT RPR	IIT MD	IIT R	IIT (BHU)	IIT JMU	IIT PKD	IIT TP	
e- journals	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18
Databases	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18
Newspaper clipping	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	04
Remote Access	1	1	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1	0	14
OPAC	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	16
ILL/ Document delivery	0	1	0	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	11
Link to other websites	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	0	15
Ask a Librarian	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	04
SCORE	06	06	05	06	06	03	04	05	06	07	07	05	06	07	06	07	06	02	

Table 3 lists all the major services provided by the library. All the IIT libraries are providing the service of e-journals and databases. The newspaper clipping is one of the important services that is only provided by the IIT Patna, Delhi, Jammu, and Palakkad. Only 04 IITs provide the feature of **'Ask a Librarian'** service. 14 IITs featured their library with remote access facility, 16 IITs provide OPAC and only 14 IITs have the facility of ILL/Document Delivery service. Here, IIT Tirupati scores are very low as compared to other IITs as it doesn't provide any other services except e-journals and databases.

Table 4 shows the salient features of the library which are to be present on the website to make it more accessible like it must be connected to social media platforms so it may increase its reach. From the Table 4, only IIT Guwahati and Kanpur mentioned the last update on their website. Only IIT Kharagpur, Hyderabad, Patna, Roorkee, and BHU provides the feedback feature to their users of the library.

Table 4: Features of the Library Website

Features	IITs																		TOTAL
	IITBBS	IITM	IITG	IITI	IITK	IITJ	IITKGP	IITH	IITB	IITP	IITD	IITRPR	IITMD	IITR	IIT(BHU)	IITJMU	IITPKD	IITTP	
Last Update	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	02
Navigation	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	04
Login/ Registration	0	0	1	0	1	1	1	0	0	0	1	0	1	1	1	0	0	0	07
FAQ's	1	0	0	0	1	1	1	0	1	1	1	0	0	1	1	1	1	0	11
Feedback	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	0	05
Photo/Video	0	1	0	1	1	1	1	0	0	1	1	0	0	1	1	0	0	0	09
Social Networking	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0	1	0	1	08
SCORE	02	01	02	01	04	04	05	01	03	04	05	01	01	04	05	02	01	01	

Seven IITs provide the Login/Registration facility, and 11 IITs provide the FAQ services on their website. 'Feedback' is one of the major services of any website that must be provided by the websites as it helps to know the positive and negative aspects of the services provided by the website. However, only 05 IITs are providing Feedback service. IIT Tirupati doesn't have any of these features on its website except social connectivity.

Table 5: Score of the IITs based on the Content of the Website

Score	IITs																	
	IITBBS	IITM	IITG	IITI	IITK	IITJ	IITKGP	IITH	IITB	IITP	IITD	IITRPR	IITMD	IITR	IIT(BHU)	IITJMU	IITPKD	IITTP
General Information	10	09	10	09	11	03	07	05	09	08	11	11	09	12	11	10	07	03
Services	06	06	05	06	06	03	04	05	06	07	07	05	06	07	06	07	06	02
Features	02	01	02	01	04	04	05	01	03	04	05	01	04	04	05	02	01	01
Total	18	16	17	16	21	10	16	11	18	19	23	17	20	23	22	19	14	06

Table 5 combines the above listed features and their scores so that they can be ranked for further comparison. IIT Delhi and Roorkee, with scores of 23 are the highest among all, while IIT Tirupati has a low score of 06.

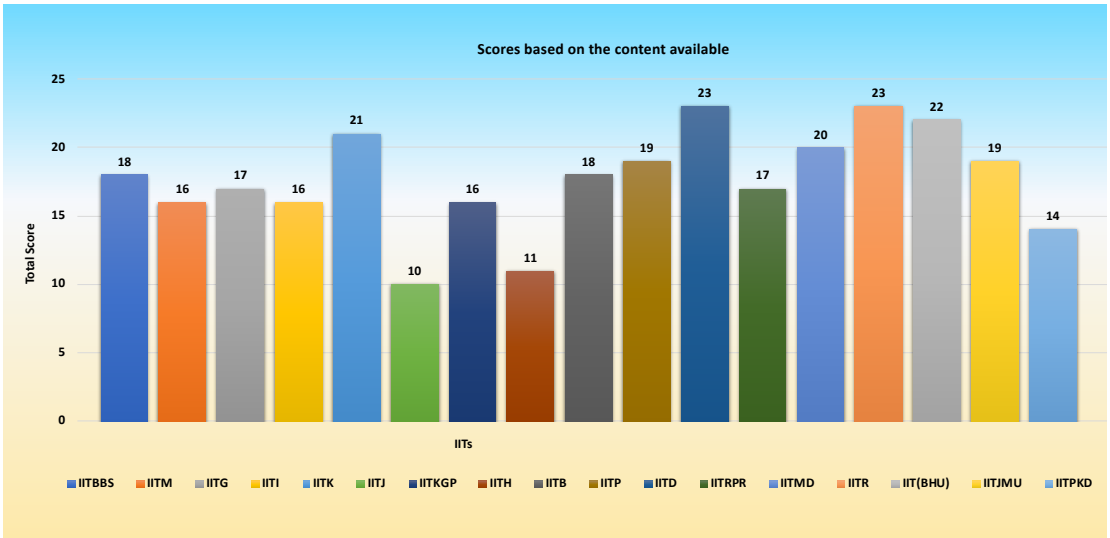

Figure 1: Scores based on the Availability of Content

ii. Calculation of WISER Ranking

Table 6: Rich Files Available on the Websites

IITs	PDF	PPT	XLS	DOC	Total Files
IITBBS	44,800	35,900	62,100	35,400	1,78,200
IITM	5,400	5,250	4,760	5,400	20,810
IITG	1,28,000	54,600	55,300	31,900	2,69,800
IITI	46,00,000	6,14,000	10,40,000	23,80,000	86,34,000
IITK	32,600	8	12,900	32,500	78,008
IITJ	10,700	12,900	16,600	32,100	72,300
IITKGP	61,000	1,80,000	35,100	1,88,000	4,64,100
IITH	4,03,000	23,100	3,35,000	3,62,000	8,21,600
IITB	2,80,000	3,80,000	1,14,000	1,04,000	8,78,000
IITP	26,400	11,200	12,400	14,600	64,600
IITD	47,200	23,400	1,28,000	33,900	2,32,500
IITRPR	49,900	11,700	45,000	11,600	1,18,200
IITMD	16,500	12,000	15,800	15,800	60,100
IITR	47,000	27,500	26,000	29,500	1,30,000
IIT (BHU)	12,300	12,700	9	11,300	36,309
IITJMU	5,390	5,020	5,240	6,110	21,760
IITPKD	2,720	1,990	2,220	2,130	9,060
IITTP	193	33	77	141	444

Table 6 shows the various type of files (pdf, xls, ppt and doc) which are available on the websites. More the rich files, reflects richer the website. It is clear from the Table 6 that, IIT Indore has 86,34,000 total files followed by IIT Bombay and Hyderabad with a total of 8,78,000 and 8,21,600 files. IIT Tirupati has only 444 total files available on its website.

Table 7: Calculation and Ranking of the Websites as per WISER Index Value

IITs	Web pages (S)	In links (V)	Rich Files (R)	Google Scholar (Sc)	WISER Index Value	Rank
IITBBS	26,000	28	1,78,200	5	5.488	17
IITM	5,300	59	20,810	20	7.465	14
IITG	2,12,000	30	2,69,800	4	10.189	5
IITI	15,50,000	71	86,34,000	4	11.932	2
IITK	33,100	107	78,008	6	9.571	8
IITJ	13,300	32	72,300	4	8.408	12
IITKGP	2,40,000	27	4,64,100	7	10.674	4
IITH	3,62,000	88	8,21,600	8	11.671	3
IITB	57,400	2	8,78,000	32	9.859	6
IITP	51,000	113	64,600	4	9.525	9
IITD	46,100	40	2,32,500	949	11.960	1
IITRPR	21,100	40	1,18,200	1	8.351	13
IITMD	13,800	57	60,100	3	8.724	11
IITR	29,400	69	1,30,000	11	9.813	7
IIT (BHU)	42,700	137	36,309	3	8.838	10
IITJMU	5,870	2	21,760	1	5.759	16
IITPKD	3,650	132	9,060	1	6.992	15
IITTP	1,140	42	444	1	4.679	18

Table 7 lists the calculated value of WISER Index values of each IIT's library website. Web pages are the total web pages available on the websites and Inlinks are those links which allow navigation from one page in a website to another, whereas Google Scholar provides the number of citations received by these domains is obtained using the query syntax mentioned in the methodology.

The WISER Index value of IIT Delhi and Indore are close enough which are 11.960 and 11.932 respectively, which are ranked first and second. IIT Hyderabad with a value of

11.671 placed third, IIT Kharagpur with a value of 10.674 placed fourth, and IIT Guwahati with a value of 10.189 placed fifth position in the Table 7. IIT Tirupati with a WISER Index value of 4.679 has placed at the 18th position in the Table 7.

Table 8: Ranking of IITs based on WISER Index Value and Content-based Scores

IITs	WISER (Rank)	Content-Based (Rank)
IITBBS	17	6
IITM	14	8
IITG	5	7
IITI	2	8
IITK	8	3
IITJ	12	11
IITKGP	4	8
IITH	3	10
IITB	6	6
IITP	9	5
IITD	1	1
IITRPR	13	7
IITMD	11	4
IITR	7	1
IIT (BHU)	10	2
IITJMU	16	5
IITPKD	15	9
IITTP	18	12

Table 8 compares the ranking obtained by these IITs based on WISER Index value and content-based scores. IIT Delhi placed at first position in both rankings, meanwhile, IIT Roorkee also placed at first as it has equal content-based score. In terms of WISER ranking, IIT Indore, Hyderabad, Kharagpur and Guwahati are placed at second, third, fourth and fifth positions, respectively. On the other hand, IITBHU, Kanpur, Mandi and Patna are placed at second, third, fourth and fifth positions on the content-based ranking, respectively. However, IIT Tirupati has secured last position in both rankings.

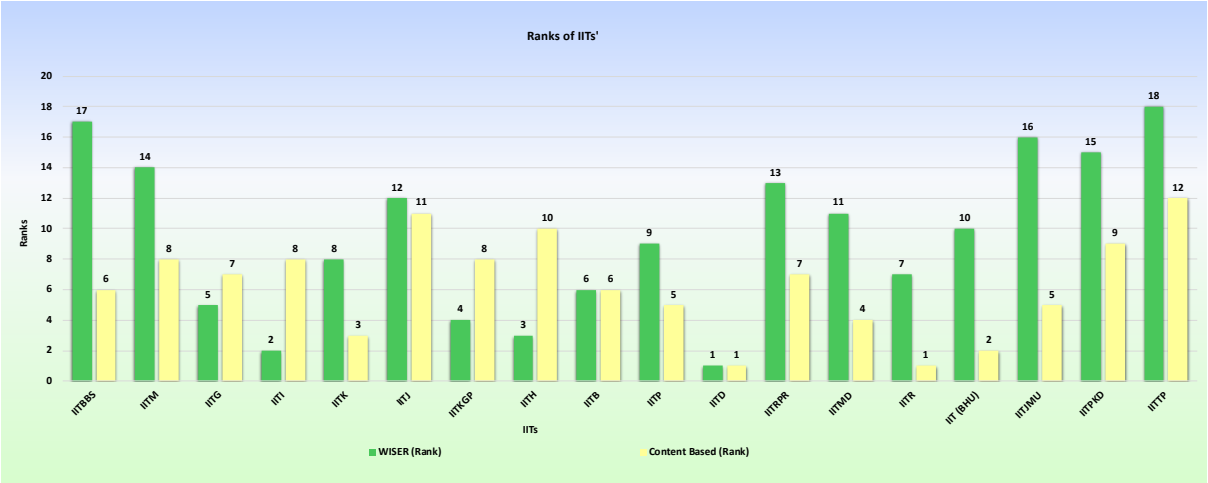

Figure 2: Ranks of IITs based on WISER Index Value and Content-based Scores

iii. Calculation of Correlation Among the Two Rankings

The correlation coefficient relates to the strength and direction of the linear relationship between two variables. The correlation will always be between -1.0 and +1.0. If the correlation is positive, we have a positive relationship. If it is negative, the relationship is negative.

The mean for the variable (X & Y) can be calculated as:

$$\bar{X} = 1/N \sum xi = 1/N(x1+x2+\ldots\ldots\ldots+ xN).\ i=1$$

The formula can be given as follows:

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[\, n\Sigma x^2 - (\Sigma x)^2 \,][\, n\Sigma y^2 - (\Sigma y)^2 \,]}}$$

Here **X** represents the WISER rank and **Y** represents the Content-based rank.

The calculated value of **r = 0.286**. Therefore, the correlation between WISER ranking and Content-based ranking is 0.286, which indicates a weak positive correlation between the ranks individually obtained through WISER and the content-based ranking.

The weak positive correlation indicates that both the ranking tends to increase but in a weak or unreliable manner. For instance, we may see from the Table 8 that the rank of IIT Delhi is similar in both rankings, but IITBHU which is placed in the second position in the Content-based rank secured the tenth position in the WISER rank. Similarly, IIT Kanpur is placed at third position in the Content-based ranking, secured eighth position in the WISER ranking.

Findings of the Study

The finding of the study reveals that IIT Delhi and IIT Roorkee have secured equal score of 23 among all, followed by the IITBHU, Kanpur, Mandi and Patna with the scores 22, 21, 20 and 19 respectively. Only IIT Guwahati and Kanpur mentioned the date of last update on their website among all. The newspaper clipping service is provided by the IIT Patna, Delhi, Jammu, and Palakkad only. All the IITs are providing the e-journals/databases services. The website of library of IIT Indore has a total of 86,34,000 rich files. IIT Indore has a total of 15,50,000 webpages, followed by the IIT Hyderabad with 3,62,000 webpages, whereas IIT Tirupati has only 1,140 webpages. The WISER Index value of IIT Delhi is 11.960, IIT Indore is 11.932, and IIT Tirupati is only 4.679. The correlation between the two rankings is found to be 0.286, and this shows that there is a very weak positive relationship between these two rankings.

Conclusion and Recommendations

The study focuses on two aspects of a website among which one is the content available on the website which a user can easily find on the website, whereas other aspect includes the analysis of URL of the website. Both aspects play an important role in developing the website in such a way that it may increase its reach to the users and utilization of contents or services provided by institutions extensively. The result of the study shows that there is a need for improvement, because in this age of digitalization, some of the IITs are not even connected to the social media platforms. The lack of social communication of the websites may have indirectly affect both the users and valuable resources of libraries. Remote access to the libraries is one of the essential services of the libraries and it must be available over the websites. The feedback service is necessarily be provided for the user so that the libraries can enhance their services and to cater user requirements. The websites should be maintained and update on regular intervals and it should be mentioned on the websites. The analysis came to the conclusion that IIT libraries' websites need to be improved.

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RESEARCH VISUALIZATION OF POST – COVID PUBLICATIONS: BIBLIOMETRIC ANALYSIS OF PUBMED DATABASE

M.P. Rajapaksha[1]

Abstract

COVID-19 is a communicable disease that impacted worldwide in December 2019 and has taken more attention from researchers. Since then, a considerable amount of medical literature on COVID-19 has been generated. However, there is insufficient information on the bibliometric direction of research output associated with Post-COVID. Therefore, this study aims to explore the published research in the PubMed database on Post-COVID using bibliometric analysis techniques from 2020 to 2021. The search was conducted using "Post COVID"[All Fields]) from 2020/1/1 to 2021/12/31. Bibexcel version 2016, Microsoft Excel 2010, and VOSviewer version 1.6.18 were used to analyze different aspects such as source type, top journals, authorship pattern, most prolific authors, language productivity, contributing countries and major keywords. Out of 2,766 research publications, the majority (n=1,374, 49.67%) of research output has been published as journal articles. *Cureus*, *International Journal of Environmental Research and Public Health*, and *Journal of Clinical Medicine* were leading journals regarding publications count. Results indicated that the majority (n=2,650, 95.81%) of publications were written in English by single authors. The most prolific authors were FernÃ¡ndez-de-Las from King Juan Carlos University (Spain), Zhang Y from Biotherapy Center, Affiliated Hospital of Zhengzhou University (China), and HernÃ¡ndez-Barrera V from the Department of Public Health, Universidad Rey Juan Carlos (Spain). The United States with 31.91% (n=165) and England with 21.66% (n=112) were two key contributors to the field. Humans, COVID-19, SARS-CoV-2, and Pandemics were the primary MeSH keywords in the related literature on Post-COVID.

Keywords: *Bibliometric analysis, Post-COVID, PubMed, Research publications, Research visualization*

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Introduction

Due to the prevalence of COVID-19 cases and survivors growing worldwide, the burden of Post-COVID-19 conditions (PCC) also increases (Erinoso, 2022). The terms linked with persisting signs and symptoms following COVID-19 are defined in the UK's National Institute for Health and Care Excellence (NICE) guideline. The recommendation makes a distinction between the terms "long COVID" and "Post-COVID-19 conditions", which were used synonymously (Erinoso, 2022). PCC refers to signs and symptoms that develop during or after COVID-19, which continue for more than 12 weeks and cannot be explained by an alternative diagnosis (Erinoso, 2022).

Post-COVID is an emerging research field after COVID-19 as it has influenced more and more people infected by COVID-19. According to the literature, many cases were reported related to the Post-COVID condition (Naseer *et al.*, 2021). Therefore, researchers from around the globe have been motivated to conduct scientific research on the symptoms associated with COVID-19. As a result of this, new knowledge was generated in unprecedented quantities, and several publishers made their publications on the disease available online for free (Corrales-Reyes *et al.*, 2021). This increases bibliometric studies relating to scientific output on the disease around the world (Corrales-Reyes *et al.*, 2021; Jin *et al.,* 2022; Kambhampati, *et al.*, 2020; Liao *et al.*, 2021; Liu *et al.*, 2020; Naseer *et al.,* 2021; Sharma & Dubey, 2021; Gorriz et al. 2022 ; Kim *et al.,* 2022). Even though, direction to the literature on Post-COVID conditions is not yet comprehensively covered by previous researches. Hence, this study will fill the research gap by providing possible direction for the scientific research output on Post-COVID-19 conditions.

Literature Review

Although there are numerous bibliometric studies focused solely on COVID-19, Post-COVID has not received much attention. Literature found that scientific databases like WoS, Scopus, and WHO databases have been used more frequently for bibliometrics research. However, the PubMed database has been used in few studies only. This is the first bibliometric study on Post-COVID-19 using the PubMed database, and only a few other studies have been done on Post-COVID-19 complications and treatment.

Using the WHO database, Sharma & Dubey (2021) conducted a bibliometric study on Post-COVID mucormycosis to evaluate the publications related to the disease. They discovered that 51 reports, including 40 articles and one clinical trial, had been published. In addition, the authors revealed that 51 reports were available in Medline out of 38 databases in the WHO

database. According to their research, Indian authors contributed the most to the research papers on Post-COVID mucormycosis. With ten research reports, *Indian ophthalmology* journals emerged as the most productive journals in the field.

Kim & others (2022) conducted a bibliometric study that included databases from Medline, Embase, and the Cochrane Library from inception until November 2021 to identify published studies on the use of Complementary and Alternative Medicine (CAM) interventions for long-term COVID. Using the bibliometric package for research, they analyzed the citations of publications using narrative analysis to determine the effectiveness and safety of CAM interventions. During the study period, there were 16 publications related to CAM, including 14 study protocols of systematic reviews or clinical studies. In addition, the authors revealed that the majority of study protocols were written by Chinese, Korean, and Indian authors, making them current research trends in the field. Finally, the authors emphasized the need for randomized control trials and systematic reviews due to the lack of published research on using CAM for long-term COVID and COVID-19 survivors.

Jin & others (2022) carried out a bibliometric study to assess and analyze the pattern of long COVID research literature and provide insights into the long COVID. The Scopus database yielded 784 papers with bibliographic information on long COVID studies. Regarding paper productivity and citations of long COVID research output, developed nations in Europe and the United States ranking top in the study in 2020 and 2021. *Nature Medicine* also had the most citations, according to the study. In contrast, the *International Journal of Environmental Research* and *Public Health* and the *Journal of Clinical Medicine* had the most publications.

Objectives

This study explores the Post-COVID-19 publications published in the PubMed database from 2020 to 2021. The specific objectives of the study are:

- To find out the publication type of Post-COVID-19 research
- To identify the most productive journals
- To identify the authorship pattern and most prolific authors in Post-COVID-19 research
- To discover the research productivity by language
- To determine the most productive countries in terms of Post-COVID-19 publications
- To detect the most frequently used keywords

Limitations of the Study

This study aims to conduct a bibliometric study on Post-COVID regardless of specific concerns or symptoms. Moreover, the study provides a general overview of the Post-COVID research publications and demonstrates some limitations inherent in the methodology of the bibliometric studies. As Akintunde *et al.* (2021) reported, false-positive and false-negative results are possible in all bibliographic studies. Therefore, only the PubMed database was used in this study, excluding other databases such as WoS, Google Scholar, and Scopus.

Methodology

PubMed database from the National Library of Medicine (NLM), the United States, was searched for Post-COVID-19 related publications from 2020/01/01 to 2021/12/31. The search was conducted during August and September 2022. All the articles retrieved from the above period were considered for the study. To search publications from the PubMed database, the term "Post-COVID"[All Fields] was used in the search field from 2020 to 2021. A bibliometric tool "BibExcel" version 2016, Microsoft excel 2010 and VOSviewer version 1.6.18 were used to analyze the collected data.

Results and Discussion

From the search, 2,766 publications were yielded on Post-COVID. It includes all publication types and source types from 2020/01/01 to 2021/12/31. Results were further analyzed according to different aspects such as top journals, authorship pattern, top contributing authors and co-authorship pattern, language productivity, contributing countries, and major keywords.

Source Type

Almost half of the publications related to Post-COVID are the Journal articles (n=1,374, 49.67%) followed by Journal article: Reviews (n=322), Case reports (n=181), Journal articles: Research support (n=143), Editorials (n=116) and Letters (n=110) respectively (Table 1).

Table 1: Source Type of Post-COVID-19 Research Publications

Document Type	Number of articles
Journal Articles	1,324
Journal Article: Reviews	322
Case Reports	181

Editorials	116
Letters	110
Other document types	520

Top Contributing Journals

The top 10 active journals contributed 17.66% of the articles to the field. Table 2 demonstrates the top 10 active journals in descending numerical order. The top three productive journals are *Cureus (n=65), International Journal of Environmental Research and Public Health (n=57),* and *Journal of Clinical Medicine (n=31).*

Table 2: Top 10 Most Active Journals in Publishing Post-COVID-19 Research

Journal titles	Number of articles
Cureus	65
Int J Environ Res Public Health	57
J Clin Med	31
PLoS One	23
Front Public Health	23
Indian J Ophthalmol	22
J Med Virol	18
Front Psychol	17
Ann Med Surg (Lond)	16
Environ Sci Pollut Res Int	16
Sci Total Environ	16
BMJ Case Rep	15
Front Psychiatry	14

Authorship Pattern

A total of 292 authors contributed to Post-COVID research, of which 2,671 publications were written by single authors (96.57%) while multiple authors contributed in 95 (3.43%) publications only.

Top Contributing Authors

There were 292 authors contributed in 2766 articles included in this study, with an average of 0.11 authors per article. Table 3 indicates the top three contributing authors for Post-

COVID related research. The most prolific authors (n=33) were FernÃ¡ndez-de-Las from King Juan Carlos University (Spain), Zhang Y from Biotherapy Center, Affiliated Hospital of Zhengzhou University (China), and HernÃ¡ndez-Barrera V from the Department of Public Health, Universidad Rey Juan Carlos (Spain). An Author, Co-authorship map is shown in Figure 1, which illustrates that FernÃ¡ndez-de-Las had the greatest total link strength (37) as he contributed in 16 papers, each with more than 14 authors.

Table 3: Top Most Prolific Authors Contributed in Post-COVID Research

Author	Number of articles
FernÃ¡ndez-de-Las	12
Zhang Y	11
HernÃ¡ndez-Barrera V	10

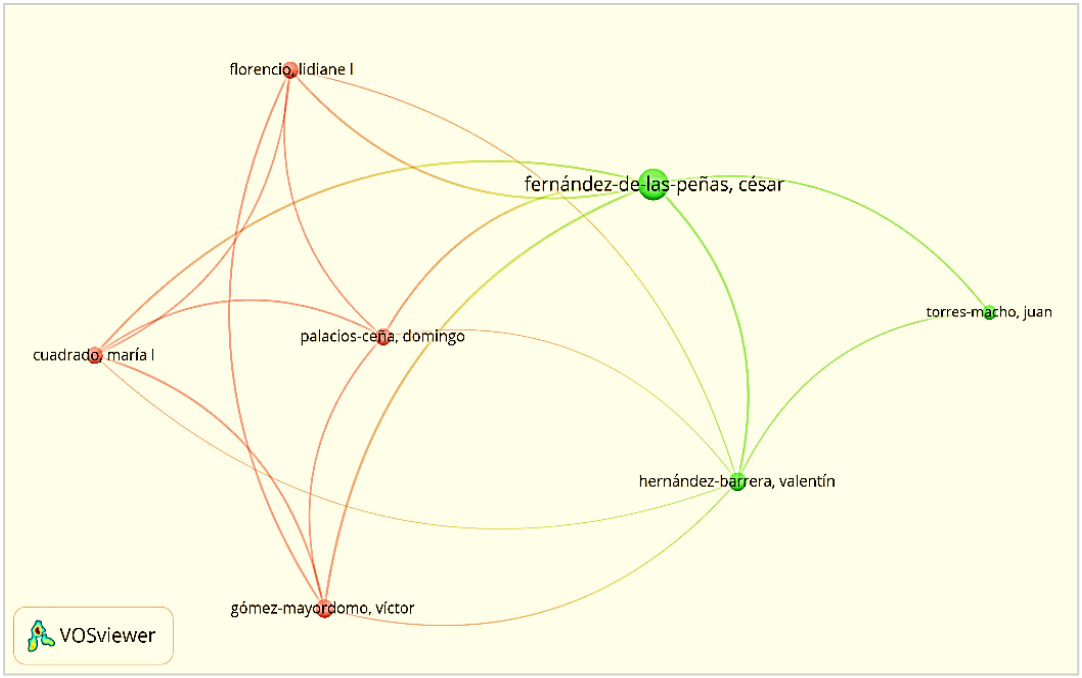

Figure 9: Network Visualization Map for Author Co-Authorship Relations

Language Productivity

Out of 2,766 publications, 95.81% (n=2,650) of the research were published in English, whereas only 116 (4.19%) were written in other languages.

Top Contributing Countries

The United States (n=165, 31.91%) and England (n=112, 21.66%) are the top in the list of countries most publishing Post-COVID related publications on the PubMed database.

Frequently used Keywords

Keyword analysis helps researchers to gain quick insight into specific areas. Therefore, in this study, VOSviewer was used for keyword co-occurrence analysis for the Post-COVID research publications via the PubMed database. A total of 100 keywords appeared more than five times and it was observed that predominantly MeSH was used for the selection of keywords, which is illustrated in Figure 2.

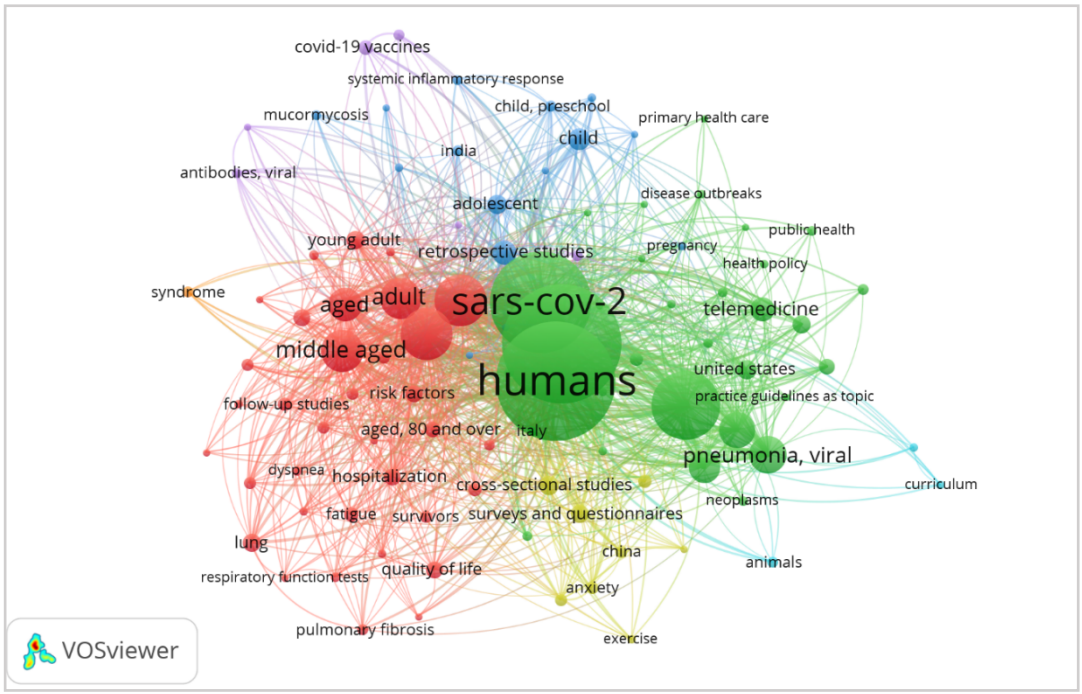

Figure 2: Co-occurrence Networks of MeSH Keywords Visualized by VOSviewer

Figure 3 demonstrates the ten most frequently used keywords. "Humans" was the most frequently used keyword, followed by "COVID-19" and “SARS-CoV-2”. SARS-CoV-2 and COVID-19 often appear together in a paper, since both terms are used synonymously to describe the cause of a coronavirus. In addition, terms such as “Pandemics," "Female," and "Male," which describes the gender-wise effect of Post-COVID symptoms also used as keywords. Besides, "Middle-aged" and "Adult" were the next group of keywords used to indicate different age groups affected by Post-COVID symptoms and their frequencies were 304 and 285 times, respectively.

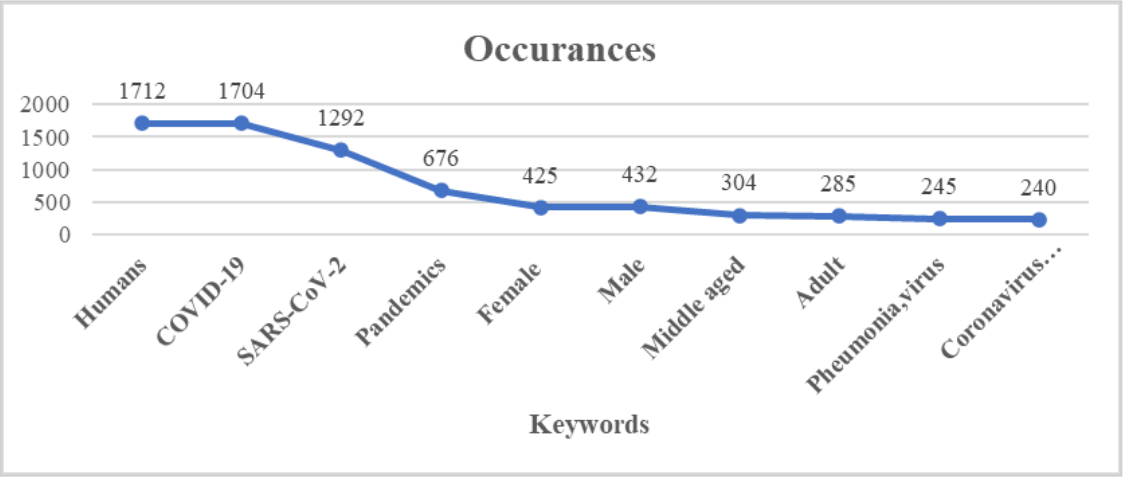

Figure 3: Top Ten Most Frequently used Mesh Keywords in Post-COVID-19 Research Publications During 2020-2021

Since this study covers only the period of 2020-2021, the search results are different with the exact keywords used in different periods due to the updates of the PubMed Database. Therefore, future studies need to be carried out in relation to keyword occurrences as per the relevance of the research studies.

Conclusion and Recommendations

This bibliometric study examined the research publications related to Post-COVID available in the PubMed database during the period 2020 to 2021, and analyzed the bibliometric characteristics such as source type, contributing journals, language productivity, authorship pattern and most prominent authors, contributing countries, and keywords used. The results showed significant progress in Post-COVID publications from 2020 to 2021.

Regarding the source type which has contributed as an evidence for research information, journal articles followed by reviews, case reports, editorials, letters, etc. were identified. Three prominent and prolific journals contributing to Post-COVID research are *Cureus, International Journal of Environmental Research and Public Health,* and *Journal of Clinical Medicine*.

Most research evidences published by individual authors and in English language. Furthermore, most contributed authors of the research output on Post-COVID were from Spanish, namely FernÃ¡ndez-de-Las from King Juan Carlos University and HernÃ¡ndez-Barrera V from the Department of Public Health, Universidad Rey Juan Carlos, who explored the Post-COVID symptoms (Fernández-De-las-peñas *et al.*, 2021).

The study also revealed that 45 countries, including both developed and developing countries, have contributed massively towards Post-COVID research. The majority of publications on Post-COVID were from USA and England, followed by Italy, Netherlands, and India. However, contributions to the study from developed countries are observed to help the people to identify the Post-COVID conditions regarding the COVID-19 pandemic.

Network visualization of keywords obtained from Post-COVD publications identified that "Humans," “COVID-19”, and “SARS-CoV-2” are in the top three positions in the related field of study.

As per the retrieved research output, there were different research topics, such as management strategies, policies, complications, symptoms, treatment, therapies, etc. Therefore, the study recommends researching the effects of Post-COVID in different fields. Since this study covers only the literature available in the PubMed database, it is suggested to conduct future studies in broader perspectives by covering other relevant databases such as WoS, Science Direct, and Scopus. Further, this study recommends to conduct bibliometric analysis on a continued basis to elaborate on the findings of Post-COVID conditions.

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RESEARCH COLLABORATION PATTERN IN THE FIELD OF DIABETES MELLITUS TYPE 1: A SCIENTOMETRIC STUDY

Richa Arya[1] and Babita Jaiswal[2]

Abstract

The present study is based on the collaborative measures of the published review articles in the area of Diabetes Mellitus Type 1. PubMed database is used to extract data on Diabetes Mellitus Type 1. There are total 1545 articles found from 2012 to 2021. These articles are analyzed based on Scientometrics indicators such as Authorship pattern, Degree of Collaboration, Collaboration Index, Collaboration co-efficient, Modified Collaboration Coefficient, and Co-Author Index. It is found that the highest number of articles (13.78%) is published in the year 2021. Three authors' collaboration is most elevated in number with 22% articles. The average degree of collaboration for all 10 years is 0.92 while the highest degree of collaboration is 0.95 found in the year 2021. The study reveals that collaborative papers are dominated in this field rather than solo.

Keywords: *Diabetes Mellitus Type 1, Collaborative measures, Degree of collaboration, Collaboration index, Authorship patterns*

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Introduction

Diabetes is the most common disease among the people around us. Diabetes is a chronic, metabolic disease characterized by elevated levels of blood sugar, which causes over time to serious damage to the heart, blood vessels, eyes, kidneys, and nerves (World Health Organization, 2022).

According to International Diabetes Federation (2020) "Around 10% of all people with diabetes have type 1 diabetes. Type 1 diabetes is caused by an autoimmune reaction where the body's defense system attacks the cells that produce insulin. As a result, the body produces very little or no insulin. People with type 1 diabetes need daily injections of insulin to control their blood glucose levels. If people with type 1 diabetes do not have access to insulin, they will die."

The IDF Diabetes Atlas Tenth edition 2021 provides the latest statistics on diabetes worldwide in 2021 (International Diabetes Federation, 2022).

i. Approximately 537 million adults (20-79 years) are living with diabetes.
ii. The total number of people living with diabetes is projected to rise to 643 million by 2030 and 783 million by 2045.
iii. Diabetes caused 6.7 million deaths.
iv. More than 1.2 million children and adolescents (0-19 years) are living with type 1 diabetes.
v. 541 million adults are at increased risk of developing type 2 diabetes.

The present study used Scientometrics indicators to measure the literature published on Diabetes Mellitus Type 1. This study shows various characteristics of Diabetes Mellitus Type 1 such as Authorship Pattern and Degree of Collaboration etc.

Review of Literature

Ganasegeran, *et al.* (2021) conducted a systematic scientometrics study to map the scientific literature published on diabetes from 2000 to 2018 in Malaysia. They analyzed these literature using three international databases (PubMed, EMBASE, Scopus) and one local database (MyCite) To analyze the contents of diabetes publications authors are using Microsoft Excel 2016, EndNote X9.2, BibExcel 2016, GraphPad Prism 8.0.1, VOS viewer software 1.6.13, and R software version 1.3.959. A total of 2094 publication records with 35,497 citations were analyzed. Kuala Lumpur was the most scientifically productive state in Malaysia and contributed 754 papers. Medical Journal of Malaysia had the highest number of publications. Most publications were non-collaborative research works.

Ramakrishnan and Thavamani (2015) presented a bibliometric analysis of the authorship pattern in the field of Hepatitis C covered in the Journal Gastroenterology from the period of 2006-2010. The study examined authorship patterns in the field of Hepatitis C. There were 137 articles from the source journal during the study period and these articles had a total of 5132cited items. Hence, only authorship pattern in the field of Hepatitis C is discussed in this paper. 93.26% of the total contributions represent collaborative research. The degree of collaboration has arrived at 0.93 during the study period. The value of the Co-Authorship Index (CAI) for a single author paper shows a declining trend from one block-year period to another block. On the other hand, for multi-authored papers, the Co-Authorship Index reveals an increasing trend.

Rasolabadi, *et al.* (2015) analyzed Iran's research performance on diabetes in national and international contexts till the end of 2014. The results showed that Iran's cumulative publication output in diabetes research consisted of 4425 papers from 1968 to 2014, with an average number of 96.2 papers per year and an annual average growth rate of 25.5%. Iran ranked 25th place with 4425 papers among the top 25 countries with a global share of 0.72%. The average of Iran's publication output was 6.19 citations per paper. The average citation per paper for Iranian publications in diabetes research increased from 1.63 during 1968-1999 to 10.42 in 2014. Based on the results, they concluded that although the diabetic population of Iran is increasing, the number of diabetes research is not remarkable.

Karuilancheran & Baskaran (2013) applied Bradford's Approach to Diabetes and Allied Diseases Research in the Indian context between 1995 and 2013. They found that the number of publications in 1995 was 92 which increase to 1121 in 2013. The highest output (13.99%) was observed in 2012. There were total 31 journals identified in the core zone with 1/3rd of the articles published. The first two Indian journals namely The Journal of the Association of Physicians of India and The Indian Journal of Endocrinology and Metabolism covered 697 articles that account to 9.73 percent of total articles. The relationship between the zones in this study was as 28:160:1174 which does not fit to Bradford's distribution.

Liu, Jiao & Chen (2011) analyzed the progress in diabetic retinopathy research between 2000 and 2010 through a bibliometric study. The total number of published articles retrieved for the years during 2000-2010 was 8590. They found that Diabetic retinopathy research changed as a linear upward trend, the main research focused on ophthalmology, endocrine and metabolic diseases. Harvard University was the major research institution. It has achieved a significant increase in the number of ISI publications and collaborations in Diabetic retinopathy literature from 2000 to 2010.

Patra & Bhattacharya (2005) conducted a bibliometric analysis of Cancer research in India. The data for the study has been downloaded from PubMed. The study analyses literature growth trends. It also examined research activities in different countries worldwide. Bradford's law of scattering was employed to identify the core journal, which published Indian cancer research literature. Lotka's law was employed to study the authors' productivity pattern. The study also identifies the active institutions in India, which published the cancer literature the most.

Although many studies on bibliometrics have been carried out over the last decade on different subjects generally to measure the authorship pattern in any discipline, there are few numbers of literature available that have conducted the bibliometric study on a specific type of disease like cancer, Hepatics C, diabetes, and this study is focused on one of the type of Diabetes that is Diabetes Mellitus type 1.

Objectives

The main objectives of the study are to examine the collaborative measures such as degree of collaboration, collaboration index, collaboration coefficient, modified collaboration coefficient, and Co- Authorship Index. The sub-objectives of the study are to find out the:

- year wise growth of literature
- Relative Growth Rate and Doubling Time of publications.
- nature of authorship pattern.

The study focuses on the Review articles on Diabetes Mellitus Type 1 published from 2012 to 2021.

Methodology

For the collection of data on Diabetes Mellitus Type 1, PubMed database is used. PubMed is an online freely available search engine. It covers primarily the references and abstracts on life sciences and biomedical topics indexed in MEDLINE database which is maintained by United States National Library of Medicine (NLM) at the National Institutes of Health. Total 1545 review articles were collected during the period of 10 years of the study. In order to collect the data on Diabetes Mellitus type 1 the main website of PubMed (https://pubmed.ncbi.nlm.nih.gov/) was accessed and MS-Excel software was used to record, tabulate and analyses of the data. The following search syntax is used for extracting data:

Diabetes Mellitus Type 1 Filters: **Free full text, Review, in the last 10 years, English, MEDLINE**

("diabetes mellitus, type 1"[MeSH Terms] OR "type 1 diabetes mellitus"[All Fields] OR "diabetes mellitus type 1"[All Fields]) AND ((y_10[Filter]) AND (freefultext[Filter]) AND (review[Filter]) AND (medline[Filter]) AND (english[Filter]))

The collected data was analyzed through the formulas given by various Authors like Subramanyam, (1983), Lawani(1980), Ajiferuke *(et al.)*, Savanur and Srikanth (2010), Garg and Padhi (2003) to measure the degree of collaboration (DC), collaboration index (CI), collaboration coefficient (CC), modified collaboration coefficient (MCC), Co- Authorship Index (CAI) and Relative Growth Rate and Doubling Time. The formulas used are discussed simultaneously with the representation of the table and graph.

Data Analysis and Interpretation

a) Year-wise Growth of Publications

The year-wise growth of literature on Diabetes Mellitus Type 1 from the year 2012-2021 is demonstrated in table 1 and figure 1. It is clear from the data that the highest number of articles (13.78%) are published in the year 2021 followed by the second highest number of articles (11.90%) published in the year 2020 and the year 2019 produced the third highest number of publications 11.78%. The minimum number of articles (5.18%) have been published in the year 2012. It is found that there are total 1545 articles published during 10 years.

Table -1

Year-wise Growth of Publications

Year	Number of articles	Percentage	Cumulative Percentage
2012	80	5.175	-
2013	130	8.409	13.686
2014	127	8.215	21.922
2015	172	11.125	33.076
2016	154	9.961	42.933
2017	145	9.379	52.336
2018	159	10.285	62.647
2019	182	11.772	74.385
2020	184	11.902	86.253

2021	213	13.777	100
Total	1546	100	

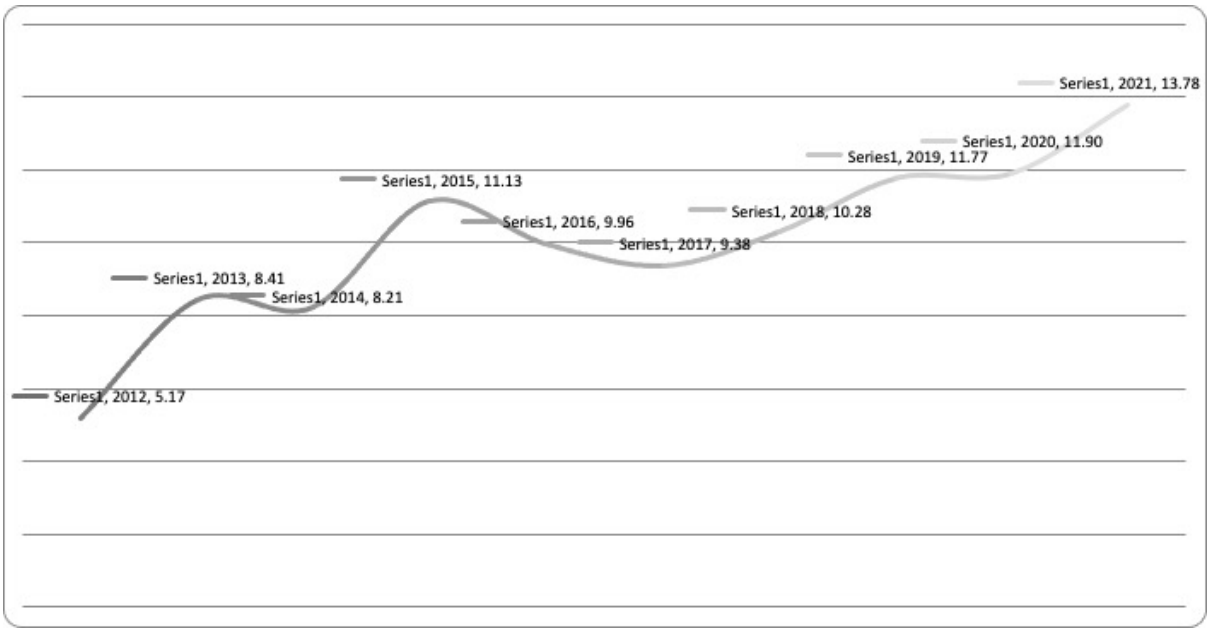


Figure-1 Year-wise Growth of Publication

b) Relative Growth Rate and Doubling Time

Table 2 shows the Relative Growth Rate and Doubling Time of articles published during 2012 -2021. It can be observed from the given table and figure that in the interval of two years from 2012 to 2013 the number of articles increased from 80 to 130, the Relative Growth Rate also increase accordingly from 0 to 0.97 and the Doubling Time increased from 0 to 0.71.The Relative Growth Rate of Publication (RGR) decreased from the rate of 0.97 in 2012 to 0.15 in 2021. The mean relative growth was 0.46 for the first four years from 2012 to 2015 whereas the mean relative growth rate for the next three years from 2016 to 2018 decreased to 0.21.

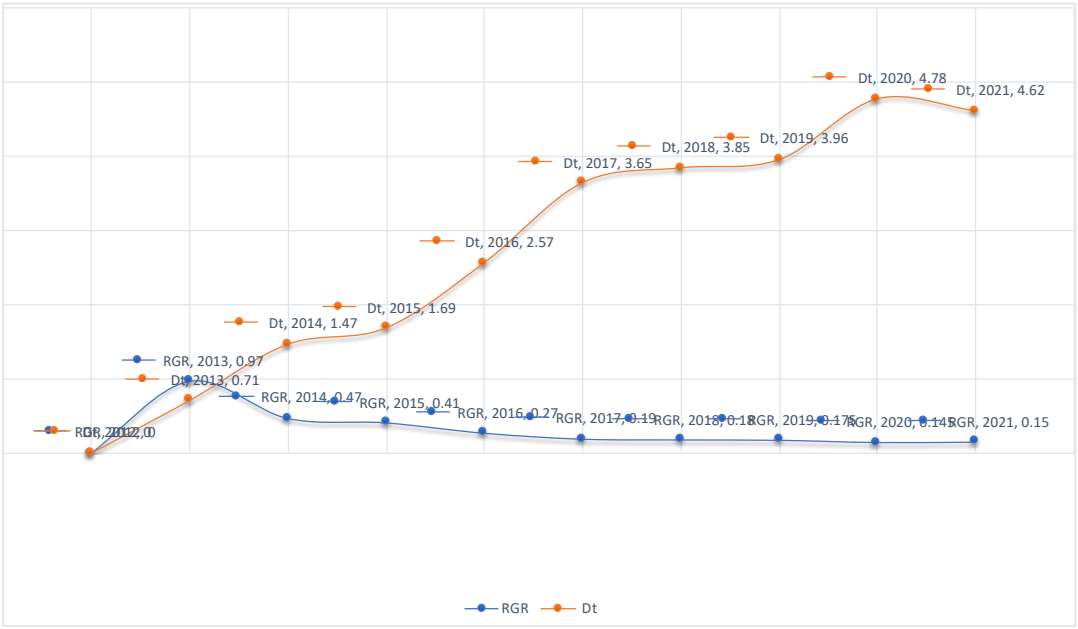
The respective Doubling Time for the 10 years successively increased from 0.71 in 2013 to 4.62 in 2021. While observing the mean Doubling Time, it is found that it gradually increased. In the first four years (2012-2015), the mean Doubling Time was 0.97 which increased to 3.36 during the next three years (2016- 2018), and in the last three years (2019-2021), it increased to 4.45. Thus it can be concluded that there is an inverse relationship between Relative Growth Rate and Doubling Time.

Table -2

Relative Growth Rate and Doubling Time

Year	Total No. of Papers	Cumulative Number of Articles	Log 1e	Log2e	Relative Growth Rate	Mean RGR	Doubling Time	Mean Dt
2012	80	80	0	4.38	0	0.46	0	0.97
2013	130	210	4.38	5.35	0.97		0.71	
2014	127	337	5.35	5.82	0.47		1.47	
2015	172	509	5.82	6.23	0.41		1.69	
2016	154	663	6.23	6.5	0.27	0.21	2.57	3.36
2017	143	806	6.5	6.69	0.19		3.65	
2018	159	965	6.69	6.87	0.18		3.85	
2019	182	1147	6.87	7.045	0.175	0.47	3.96	4.45
2020	184	1331	7.045	7.19	0.145		4.78	
2021	214	1545	7.19	7.34	0.15		4.62	

Figure-2 Relative Growth Rate and Doubling Time



c) Authorship Pattern of the Publications

Authorship pattern is used to identify the performance of authors in the field of study. Authorship pattern in any area of the study shows what trend of research productivity occurs in any discipline of science. Table 3 indicates authorship patterns of the articles published on

Diabetes Mellitus Type 1, indexed in PubMed Database. The analysis of the following table shows that three authors' collaboration (15.50% of total 6600 authors) is the highest in trend. Three authors contributed 22% of the articles followed by two authors shared 21.68% and four author contributions are 14.50% out of the total 1545 articles. Few numbers of articles published by a single author reveal that multiple authorship pattern has dominated in the area of Diabetes Mellitus Type 1.

$$\text{Average author per paper} = \frac{\text{Total Number of Author}}{\text{Total Number of Paper}} = \frac{6600}{1545} = \mathbf{4.27}$$

It is found that the average author per paper is 4.27 which means 4-5 authors' collaboration occurs in an article.

Table-3

Authorship Pattern of the Publications

S.N.	Pattern of Authorship	Frequency of Articles	Percentage of Articles	Frequency of Authors	Percentage of Authors
1	Single	130	8.41	130	1.97
2	Two Author	335	21.68	670	10.15
3	Three Author	341	22	1023	15.50
4	Four Author	224	14.50	896	13.58
5	Five Author	164	10.61	820	12.42
6	Six Author	105	6.80	630	9.55
7	Seven Author	70	4.53	490	7.42
8	Eight Author	53	3.43	424	6.42
9	Nine Author	35	2.27	315	4.77
10	Ten author	18	1.17	180	2.73
11	More than Ten author	70	4.53	1022	15.48
	Total	**1545**	**100.00**	**6600**	**100.00**

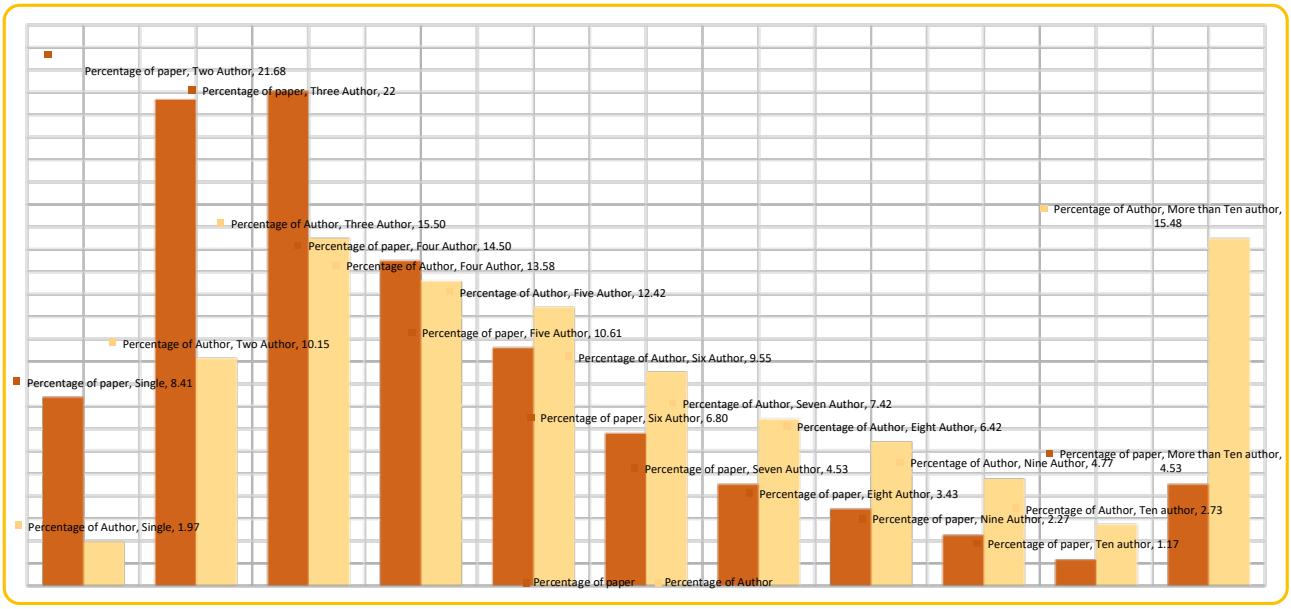


Figure: 3 Authorship Pattern of Publications

(d) Degree of Collaboration

To analyze the magnitude of research collaboration in a discipline, the formula given by Subramanyam,(1983) is used in this study.

$$\text{Degree of Collaboration (DC)} = \frac{Nm}{Nm+Ns}$$

Where,

Nm= Number of multi authors publication in a discipline during a given period of study

Ns = Number of single authors publication in a discipline during a given period of study

$$\text{DC for the period of 10 years (2012- 2021)} = \frac{1415}{1545} = \mathbf{0.92}$$

On the basis of above mention formula, the degree of collaboration for all years has been calculated and found 0.92 for the period of the study. The maximum degree of collaboration found in the year 2021 is 0.95 and followed by 0.94 in the year 2018. The minimum degree of collaboration is 0.88 found in the year 2016.

Table - 4

Degree of Collaboration

Year	Single Authored articles	Multiple authored Article	Total No. of Papers	Degree of Collaboration
2012	9	71	80	0.89
2013	11	119	130	0.92
2014	12	115	127	0.91
2015	18	154	172	0.90
2016	19	135	154	0.88
2017	10	133	143	0.93
2018	9	150	159	0.94
2019	20	162	182	0.89
2020	12	172	184	0.93
2021	10	204	214	0.95
Total	**130**	**1415**	**1545**	**0.92**

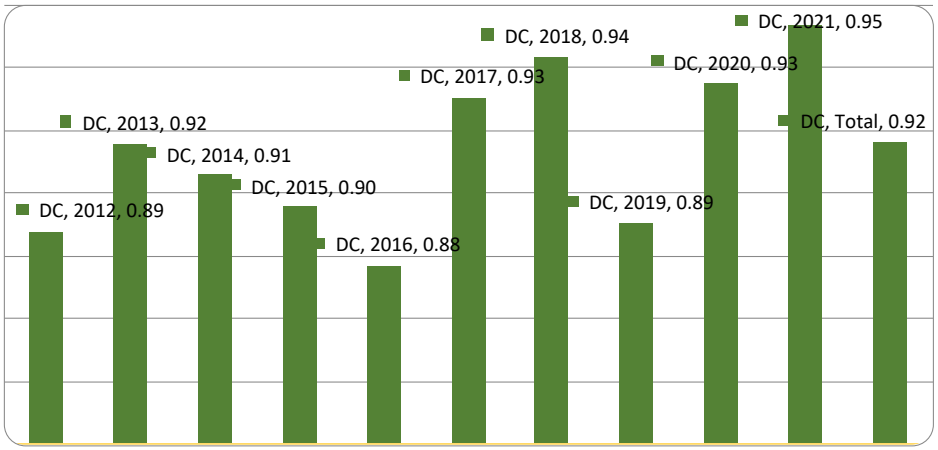


Figure:4 Degree of Collaboration

(e) Collaboration Index

Table 6 depicts the Collaboration Index of the articles. The Collaboration Index (CI) is calculated on the basis of the formula given by Lawani(1980) as:

$$CI = \frac{\sum_{j=1}^{A} jf_j}{N}$$

Where, j = Number of authors i.e. one author, two Authors, three authors, etc.

fj = The number of j-authored papers

N = The total number of the research paper published in a particular year, and

A = the total number of authors per research paper.

The average collaboration index 4.27 has been calculated on the basis of articles retrieved from 2012-2021. In the year 2018, the highest Collaboration Index 4.68 is found. The second highest collaboration is found in the year 2017 that is 4.66 and the lowest collaboration Index is 3.71 found in the year 2012.

Table -5

Collaboration Index

Year	No. of Authors											Total No. of Papers	Collaboration Index
	1	2	3	4	5	6	7	8	9	10	<10		
2012	9	18	25	10	7	3	1	2	0	1	4	80	3.71
2013	11	31	26	21	17	6	9	3	2	1	3	130	4.02
2014	12	30	24	24	14	8	3	2	0	1	9	127	4.23
2015	18	33	46	22	13	10	9	2	6	4	9	172	4.19
2016	19	42	32	23	13	5	6	5	4	0	5	154	3.76
2017	10	27	29	21	17	11	8	8	5	1	6	143	4.66
2018	9	39	36	19	18	9	7	4	6	0	12	159	4.68
2019	20	37	39	23	20	18	6	6	2	3	8	182	4.21
2020	12	43	38	28	15	19	5	9	4	4	7	184	4.34
2021	10	35	46	33	30	16	16	12	6	3	7	214	4.53
Total	130	335	341	224	164	105	70	53	35	18	70	1545	4.27

d) Collaboration Coefficient

Table 7 represents the Collaborative Co-efficient during the period of the study. The collaboration coefficient (CC) was calculated using the formula given by Ajiferuke, *et al.* in 1988 as mentioned below:

$$CC = 1 - \frac{\sum_{j=1}^{A} (1/j) f_i}{N}$$

The average collaborative coefficient is 0.65 in the area of Diabetes Mellitus Type 1.The highest collaboration coefficient 0.70 is found in the year 2021, followed by the year 2017 with 0.68 and the lowest collaboration coefficient is in the year 2016 with 0.60.

Table -6

Collaboration Coefficient

Year	No. of Authors											Total No. of Papers	Collaboration Coefficient
	1	2	3	4	5	6	7	8	9	10	<10		
2012	9	18	25	10	7	3	1	2	0	1	4	80	0.61
2013	11	31	26	21	17	6	9	3	2	1	3	130	0.64
2014	12	30	24	24	14	8	3	2	0	1	9	127	0.63
2015	18	33	46	22	13	10	9	2	6	4	9	172	0.63
2016	19	42	32	23	13	5	6	5	4	0	5	154	0.60
2017	10	27	29	21	17	11	8	8	5	1	6	143	0.68
2018	9	39	36	19	18	9	7	4	6	0	12	159	0.66
2019	20	37	39	23	20	18	6	6	2	3	8	182	0.65
2020	12	43	38	28	15	19	5	9	4	4	7	184	0.66
2021	10	35	46	33	30	16	16	12	6	3	7	214	0.70
Total	**130**	**335**	**341**	**224**	**164**	**105**	**70**	**53**	**35**	**18**	**70**	**1545**	**0.65**

e) Modified Collaboration Coefficient

Table 7 reveals Modified Collaboration Coefficient during the period of study. The modified collaboration coefficient (MCC) is a product of the Collaboration Coefficient and derived by the formula suggested by Savanur and Srikanth (2010) as mentioned below:

$$\mathrm{MCC} = \left(\frac{N}{N-1}\right)\left\{1 - \frac{\sum_{j=1}^{A}\left(\frac{1}{j}\right)fj}{N}\right\}$$

The overall modified collaboration coefficient 0.65 was calculated for the year 2012-2021. The highest modified collaboration coefficient is counted in the year 2021 with 0.70, followed by the year 2017 with 0.68 and the lowest modified collaboration coefficient is in the year 2012 with 0.61.

Table- 7

Modified Collaboration Coefficient

Year	No. of Authors											Total No. of Papers	Modified Collaboration Coefficient (MCC)
	1	2	3	4	5	6	7	8	9	10	<10		
2012	9	18	25	10	7	3	1	2	0	1	4	80	0.61
2013	11	31	26	21	17	6	9	3	2	1	3	130	0.64
2014	12	30	24	24	14	8	3	2	0	1	9	127	0.63
2015	18	33	46	22	13	10	9	2	6	4	9	172	0.64
2016	19	42	32	23	13	5	6	5	4	0	5	154	0.60
2017	10	27	29	21	17	11	8	8	5	1	6	143	0.68
2018	9	39	36	19	18	9	7	4	6	0	12	159	0.67
2019	20	37	39	23	20	18	6	6	2	3	8	182	0.65
2020	12	43	38	28	15	19	5	9	4	4	7	184	0.66
2021	10	35	46	33	30	16	16	12	6	3	7	214	0.70
Total	**130**	**335**	**341**	**224**	**164**	**105**	**70**	**53**	**35**	**18**	**70**	**1545**	**0.65**

f) Co- Authorship Index

Garg and Padhi (2003) suggested a formula to compute CAI. It is obtained by calculating proportionally the publications by single, two, three or more authored papers for different blocks of the years**.**

$$CAI = \frac{Nij}{Noj} \div \frac{Nio}{Noo} \times 100$$

Where Nij= No. of publication for the particular authorship pattern for a particular year

Nio= total output for the particular authorship pattern

Noj= total output of the particular year

Noo= total output of all years covered by the study

j = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 ,>10

CAI = 100 The number of publications is the average within a co-authorship pattern.

CAI >100 The number of publications is higher than the average

CAI <100 The number of publications is lower than the average.

For the analysis of the Co-Authorship index, all the data was divided into two blocks. First block covers the data from 2012-2016 and second block represented the data from 2017-2021 with 5-year interval. It is clear from the table that the value of COI for a single author and 2-4 authored papers has been lower than average and showed decreasing in trend from 1.24 to 0.82 and 1.1 to 0.96, respectively, whereas COI for 5-7 authored papers & 8-10 authored paper have increased from 0.85 to 1.11 and 0.73 to 1.21, respectively. On the other hand COI for more than 10 author paper showed there is no change from 2012 to 2021.

Table- 8

Co-Authorship Index (CAI)

Year	Single Author	2-4 authored papers	5-7 authored papers	8-10 authored papers	> 10 Author	Total
2012-2016	69	407	124	33	30	663
CAI	1.24	1.1	0.85	0.73	1.00	
2017-2021	61	493	215	73	40	882
CAI	0.82	0.96	1.11	1.21	1.00	
Total	130	900	339	106	70	1545

Findings and Conclusions

The highest number of articles (13.78%) are published in the year 2021 followed by the second highest number of articles (11.90%) published in the year 2020 and the year 2019 produced the third highest number of publications 11.78%. The minimum number of articles (5.18%) have been published in the year 2012.

The Relative Growth Rate of Publication (RGR) decreased from the rate of 0.97 in 2012 to 0.15 in 2021. The respective Doubling Time for the 10 years successively increased from 0.71 in 2013 to 4.62 in 2021.

Three authors collaboration (15.50% of total 6600 authors) is highest in trend. Three authors contributed 22% articles followed by two authors shared 21.68% and four author contributions are 14.50% out of the total 1545 articles. Thus it can be concluded that multiple authorship pattern has dominated in the area of Diabetes Mellitus Type 1.

The maximum degree of collaboration found in the year 2021 is 0.95, followed by 2018 (0.94). However, the minimum degree of collaboration found in the year 2016 is 0.88.
In the year 2018, the highest Collaboration Index 4.68 was found, followed by the year 2017 which has the second highest collaboration Index 4.66 and the lowest collaboration Index 3.71 found in the year 2012. The highest collaboration coefficient 0.70 is found in the year 2021, followed by the year 2017 with 0.68 and the lowest collaboration coefficient is in the year 2016 with 0.60. The highest modified collaboration coefficient is counted in the year 2021 with 0.70, followed by the year 2017 with 0.68 and the lowest modified collaboration coefficient is in the year 2012 with 0.61.

COI for single author and 2-4 authored papers has been decreasing in trend from 1.24 to 0.82 and 1.1 to 0.96, respectively whereas COI for 5-7 authored papers& 8-10 authored papers have increased from 0.85 to 1.11 and 0.73 to 1.21, respectively and COI for more than 10 authored are equal in both year blocks.

Thus it can be concluded that in the year 2021, the highest number of articles was 13.78% of the total 1545 published. The degree of collaboration (0.95), collaboration coefficient (0.70) and modified collaboration coefficient between authors (0.70) was also the highest found in the year 2021. The nature of the authorship pattern showed collaborative in nature rather than solo authorship in the area of Diabetes Mellitus Type 1.

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IMPORTANCE-SATISFACTION ANALYSIS OF LIBQUAL SERVICE QUALITY ATTRIBUTES IN THE SRI LANKAN CONTEXT

J.J.G. Arachchige[1]

Abstract

Service quality measuring tools and methods should be revisited to address the changing environments. Although there are criticisms, LibQUAL+ is a well-tested tool for validity and reliability in different continents and is suitable for the Sri Lankan university library context too. To measure the service quality in university libraries, LibQUAL survey items were selected and tested for their applicability using the Importance-Performance Analysis (IPA) matrix with a randomly selected sample of 1,791 respondents. The sample consisted of 2,000 users including teachers and undergraduates selected from eight state universities in Sri Lanka. Results indicated that there was a significant gap between users' expected quality and perceived quality (t (1,790) = 43.053, p<0 001). The IPA results showed that 13 service quality attributes related to 'Library as Place' and "Service Affect' dimensions fell into quadrant II implying that those attributes are highly important and highly performed (satisfied). Four quality attributes fell into quadrant III while three attributes to quadrant IV. No variable was fallen into quadrant I indicating that no item was highly important and low performance. The IPA matrix is very helpful for librarians to evaluate service quality. Future studies should consider discovering more quality variables and more robust methods to evaluate service quality in turbulent environments.

Keywords: *Service quality, LibQUAL items, University libraries, Importance-Performance analysis, Quality evaluation methods, Sri Lanka*

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Introduction

Library quality evaluation is a never-ending process because quality expectations are changing according to the turbulent changes in the library service environment. These turbulences occur as predictable as well as unpredictable changes. If analogies are taken from recent history, users' expected library services in Sri Lanka were dramatically changed due to the pandemic situation as well as the conditions created by the economic crisis. Therefore, quality evaluations should be revisited from time to time to address the changing needs.

Assessment of Academic Libraries

Throughout its long history, academic librarians have assessed their libraries through indicators based on input, output, outcome, and impact aspects which were valid to show the internal performance as well as the external perspective of the library. These indicators focused on the assessment statistics such as finding the purpose of visiting the library, use of the library resources, facilities & services available, determining the level of satisfaction of users, and the types of information sources they used (Saikia & Gohain, 2013). All of these measures have links to the service quality.

It is very hard to find a single unique definition for service quality. Defining service quality is still incomplete and subject to many debates and interpretations. Some scholars have used the concept of quality in the forms of impact, value, worth, or satisfaction. Service quality is intangible and is experienced while using the service. It is heterogeneous because people perceive it differently depending on the environment, situation, the mood of the consumer, past experiences of the receiver, time of delivery, attitudes of the service provider, and so on. Many critiques of service quality emphasize that quality is an attitudinal concept and hence it pertains to a psychological paradigm that is difficult to measure.

Service quality is the overall evaluation of the services provided by the firm (Parasuraman *et al.*, 1988) and it is the relative inferiority or superiority of the firm (Bitner *et al.*, 1994). Service quality represents the attitude of the long-run, overall evaluation of the service (Cronin & Taylor, 1994) and is a measure of the extent to which the service can meet or exceed customers' expectations. Customers of the modern market want the firm to provide them with goods and services that match their expectations (Cronin *et al.*, 2000). This meeting of user expectations would be the quality.

The service provider is required to understand the service user's perception of the quality. Quality implies not doing well but understanding what is important to the user and doing those things well (Martin *et al.*, 2020). Service quality in academic libraries involves

three main areas: information resources, the environment, and staff involvement (Hernon & Nitecki, 1999). Thus, measuring the service quality is not a simple task.

Perception-based Evaluation of the Service Quality

Although the earlier measures were concentrated on the service provider's perspective, later developments of the service quality measuring moved onto the assumption that the customer decides the quality. Hence, customer perception gained much attention and practitioners followed many theories such as the confirmation/disconfirmation theory to measure the perception-based quality. Quality is a powerful indicator of satisfaction. Therefore confirmation/disconfirmation theory is used to compare the customers' perceptions regarding the services provided by a firm (Wang & Pearson, 2002). In this scenario, practitioners tended to measure the quality of customer satisfaction rather than the traditional assessments solely based on various counts such as collection size, number of users registered, number of user contacts, etc. Although asking the customers about their attitudes towards the service they received is a subjective mechanism (Hossain *et al.*, 2013), one cannot ignore the satisfaction-based measurement because the perception of an individual tells something important about the quality.

Quality and Satisfaction

Quality and satisfaction are highly used terms in the literature. Some argue that both terms are similar in interpretation and some argue that they are different concepts. Conceptually the terms share similar meanings. Quality is an antecedent to satisfaction (Mukuvi, 2013) and hence quality and satisfaction are interrelated (Anderson & Fornell, 1994; Bolton & Drew, 1991; Cronin & Taylor, 1992; Eshghi *et al.*, 2008; Woodside & Wilson, 1994). Some believe quality leads to satisfaction while others support the concept that satisfaction causes quality (Cronin & Taylor, 1992; Negi, 2009; Parasuraman *et al.*, 1988; Saravanan & Rao, 2007). Asubonteng *et al.* (1996) accept that there are measurable attributes of both quality and satisfaction.

Customer satisfaction is a popular topic in marketing (Kotler, 2014). According to Elliot (1995) and Smith & Bolton (2022), satisfaction is an emotional reaction to a specific transaction or service. Calvert (2008) asserts that service quality is more holistic than satisfaction. Service quality and customer satisfaction are very important to retain customers with the business. Both are influential on the success of the university library. In overall

consideration, user satisfaction and service quality have distinct dimensions, but they are interdependent, interrelated, and share many common attributes.

Importance of the LibQUAL Instrument

Various service quality assessment models have been used to evaluate the library. To name some of them are: the Balanced Scorecard Model (BSC), European Foundation for Quality Management (EFQM) Model, SERVQUAL Model, SERVPERF Model, Total Quality Management Model (TQM), LibQUAL+™ instrument, and ClimateQUAL model.

L1bQUAL+ instrument which has been developed by the Association of Research Libraries is an important tool to measure the service quality in academic libraries. It has been adopted from SERVQUAL by making necessary modifications to suit the library environment, particularly for the ARL member libraries (Kyrillidou 2009; Posey, 2009). According to Kyrillidou (2009), LibQUAL+ is a grounded protocol that includes a standard set of items. Naidu (2009) asserts that the LibQUAL+ tool provides a more reliable survey in terms of measuring the gap between user expectations and perceptions. LibQUAL+ is more flexible for the understanding of user needs (Marnane, 2004).

The LibQUAL+ survey includes 22 survey items to measure the overall service quality of the library. It has three dimensions viz. 'Service Affect', 'Information Control', and 'Library as Place'. The 'Service Affect' dimension measures the interpersonal component of library service through nine questions. The 'Information Control' dimension measures the service quality from the perspective of the content of the resource collections and access to them. It measures eight questions in the LibQUAL tool. The dimension 'Library as Place' measures the library on its physical facilities environment and five questions measure it. LibQUAL is considered an important benchmark widely used by many academic libraries in the world to measure their patron needs and satisfaction (Li, 2017).

Despite its merits and success, there are many criticisms too (Posey, 2009). According to Edgar (2006), service adequacy is very difficult for the customer to evaluate. Roszkowski *et al.* (2005) argue that incongruity can arise when satisfaction is measured as the scores between actual and desired service level measurement. Saunders (2007) noted that LibQUAL+ is difficult for librarians to tailor to their own assessment needs and that patron perceptions are not the only important measure for library assessment.

However, there is a consensus of published research that LibQUAL+ is a valuable means of assessment for academic libraries (Li, 2017; Nicol & O'English, 2012). The reliability and validity of LibQUAL have been confirmed by many researchers (Boyce, 2017;

Heath, 2004; Heath *et al.*, 2002; Kyrilidou & Heath, 2004; Thompson *et al.*, 2005; Thompson & Cook, 2002; Xi & Levy, 2005). LibQUAL+ is an internationally available tool that contains standardized questions as well as additional questions unique to a given library. Thus, survey items used in the LibQUAL+ tool can be utilized to construct a measuring instrument for measuring library service quality perception among users. LibQUAL instrument is reliable and valued in exploring users' expectations regarding the library service in the Indian subcontinent setting and hence in Sri Lanka.

Given the above context, the LibQUAL tool plays a dominant role in evaluating the service quality in university libraries. As the tool has been designed specifically for the university library environment, and has been tested and highly utilized in different continents of the world, the author of this article assumes that it is still valid and reliable to measure service quality in university libraries.

Therefore, it is important to assess how users in the Sri Lankan context feel about the items in the LibQUAL protocol and how these items can be used to map the importance and satisfaction of service quality attributes among users.

Aims and Objectives

The primary objective of this study is to measure the importance and satisfaction of the service quality through LibQUAL items and analyze them in the Importance-Performance framework in the Sri Lankan university library context. The study was guided by the following research questions:

1. How about the users expected level and perceived level of service quality in the university libraries?
2. Is there a significant difference between the expected level and the perceived level of service quality?
3. How the service attributes can be identified as important and satisfactory according to the user's viewpoint?

Methodology

By employing a sample survey method, this study administered a structured questionnaire designed to collect data from the users of university libraries regarding the expected level of services and the perceived level of performance of those services.

The research instrument was developed by adopting LibQUAL survey items focusing on the local context. The survey statements were translated into Sinhala and Tamil languages so that

respondents can understand them in any medium they were convenient. The instrument went through a vigorous process of questionnaire development to ensure its validity and reliability. The questionnaire included 22 survey statements related to the service quality of university libraries. All the survey items were measured in two aspects: 'expected level' (importance of the service) and the 'perceived level' (satisfaction of the performance) and respondents were asked to rate their responses within the weighting from 1 to 9 where 1=very low and 9=very high.

The sample was selected from eight universities viz. University of Peradeniya, University of Colombo, University of Sri Jayewardenepura, University of Kelaniya, University of Jaffna, University of Ruhuna, Eastern University of Sri Lanka, and the Rajarata University of Sri Lanka. In sampling, it attempted to cover overall geographical areas of the country and respondents from all main subject streams. Therefore, eight universities representing six provinces that conduct courses in Humanities & Social Sciences, Natural Sciences, Management & Finance, and Medical Sciences were selected. Three universities from the Western Province were included because the dispersion of the academic community is relatively large in these areas. The sample consisted of 2000 library users including undergraduates and teachers selected on a random basis representing 250 users from each university. In selecting the teacher respondents, an equal number (10) of teachers from each subject major (Faculties) of the respective university was included into the sample using the university Web. Fifty (50) student respondents from each subject major of the respective university irrespective of their batch were selected with the support of the library staff. The questionnaires were distributed on the Google form link to the respondents in February 2021 and hard copies were provided on request.

Collected data were analyzed with descriptive analysis and inferential analysis using the SPSS package version 25. Mainly the IPA technique was used to map the dispersion of factors from the data.

Importance-Performance Analysis (IPA)

The Importance-Performance Analysis is a gap analysis technique used to map how the individuals of an organization feel about the service they receive in terms of the importance of the service and how they are satisfied with the performance (Martilla & James, 1977; Sinischalchi *et al.*, 2008). It can be used to identify the levels of the highest mean and lowest mean of the score and the spreading of the scores of attributes over the framework in four quadrics (Chaudhary *et al.*, 2016). The IPA analysis provides the performance of the survey

item and its importance through the clients' ratings which will be important to make decisions on whether the item should be kept, developed, or removed. This combined view in two components can be used to estimate the situation of the service delivery (Silva & Fernandes, 2010).

This method can be easily applied to the academic library sector to view the clients' perception of the performance and the importance of quality attributes. Mallya and Patwardhan (2018) used this method in college libraries to measure the students' perception of service quality.

IPA framework uses a four quadrants matrix to indicate the ratings of respondents. Quadrant I represents the area of 'high importance and low performance'. Quadrant II represents the area of 'high importance and high performance'. Quadrant III represents the area where the ratings fall into 'low importance and low performance', and quadrant IV includes the area of 'low importance and high performance'. These four quadrants are useful to understand the status of the service attributes (Figure 1).

Basically, it uses the x-axis and y-axis, where the x-axis represents the status of performance and the y-axis represents the status of importance.

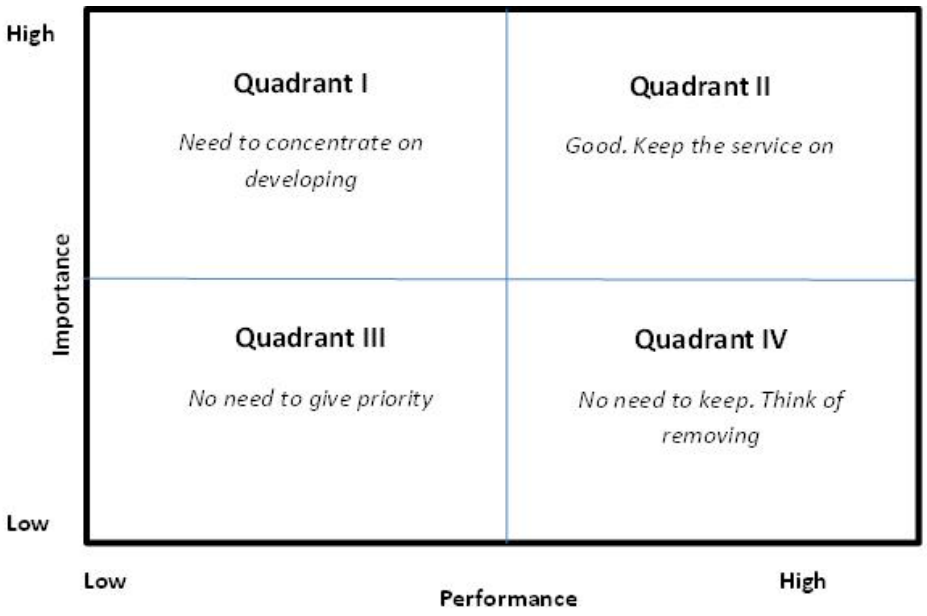

Figure 10: Importance-Performance Analysis (IPA) framework

By analyzing the falling of factors in the IPA framework, managers can decide the status of the factors whether they perform well or whether they are counted as important to customers. Accordingly, if the factors fall into Quadrant I, they are considered highly important for customers but performed low in the organization. This condition says that although these

services are very important for customers, they are not provided satisfactorily and the management should concentrate on the development of their performance. The factors or services falling on Quadrant II are considered highly important and highly performed by the organization. These services should be continued as essential and successful. Factors falling into Quadrant III are not highly required for the organization but can be developed to retain. However, the factors in Quadrant IV are not required to maintain by the organization.

Findings and Discussion

The response rate was 90.1% which was good for the representation of the sample. Out of 2000 questionnaires, 1,802 questionnaires were received and there were 1,791 questionnaires that were usable for analysis.

Among the respondents, 14.8% were teachers and 85.1% were undergraduates. Further, 69.1% were females while 30.8% were males. When considering the usage of the library, 21.5% of respondents visited the library daily, 27.8% of respondents visited the library twice a week, and 16.8% of respondents visited the library once a week. The data also indicated that among respondents 9.3% visited the library once in two weeks, 10.1% of respondents once a month, and 14.1% respondent rarely when a need has arisen. Accordingly, library usage among teachers and students seems at average level and their responses can be considered a valuable representation of the use.

The study selected 22 attributes of service quality for the investigation and measured them according to the expected level and perceived level. The expected level was considered as the level of the users' importance of the attribute and the perceived level was considered as the level of satisfaction of the particular service quality attribute. Descriptive statistics indicate that there was a gap between the importance and satisfaction of each quality attribute. Table 1 describes the details of the expected level and perceived level of each service quality attribute under study.

Table 1: Descriptive Statistics of Service Quality Attributes According to Expected Level and Perceived Level

Item Code	Quality Attribute	Expected level of the services		Perceived level of the services	
		Mean	SD	Mean	SD
UQSA1	Ability of library staff to instill confidence in me	7.34	1.670	5.38	2.070

UQSA2	Ability of the library staff to pay individual attention to me	7.01	1.908	5.10	2.261
UQSA3	Consistent courteousness of the library staff to me	7.79	1.562	6.12	2.284
UQSA4	Readiness of the staff to respond to my questions	7.95	1.483	6.44	2.179
UQSA5	Knowledge of the staff to answer my questions	7.90	1.479	6.49	1.999
UQSA6	Caring fashion of the staff when dealing with me in the library	7.80	1.474	5.98	2.144
UQSA7	Ability of library staff to understand my needs	7.73	1.521	6.02	2.052
UQSA8	Willingness of the library staff to help me	7.89	1.451	6.25	2.163
UQSA9	Trustworthiness of the staff in handling my service problems	7.74	1.503	6.32	1.998
UQIC10	Making electronic resources accessible from my home or office	7.52	1.821	5.04	2.435
UQIC11	Capability of the Website to enable me to locate information on my own	7.80	1.600	5.92	2.345
UQIC12	Availability of needed printed library materials for my work	7.85	1.525	5.97	2.133
UQIC13	Availability of electronic information resources that I need	7.69	1.611	5.66	2.159
UQIC14	Availability of modern equipment to let me easily access needed information	7.68	1.597	5.52	2.144
UQIC15	User-friendliness of access tools to find things on my own	7.71	1.537	5.73	2.084
UQIC16	Easy accessibility to information for independent use	7.74	1.545	5.97	2.078
UQIC17	Availability of print and/or electronic journal collections required for my work	7.70	1.613	5.76	2.099
UQLP18	Availability of Library Space that inspires study and learning	8.05	1.440	6.48	2.183
UQLP19	Availability of quiet space for individual activities	8.15	1.440	6.80	2.152

UQLP20	Availability of comfortable and inviting location of the library	8.07	1.440	6.55	2.197
UQLP21	Capability of the library as a getaway for study, learning or research	8.00	1.440	6.42	2.084
UQLP22	Availability of Community Space for group learning and group study at the library	7.62	1.440	4.24	2.410
Valid N (listwise)	*1790*				

When considering the mean score and standard deviation, it shows that there is a difference between the expected level and perceived level. Figure 2 visually indicates this difference. In an overall view, the perceived level falls between a standard deviation of 2.0 and 2.4, however the expected level falls between 1.4 and 1.8.

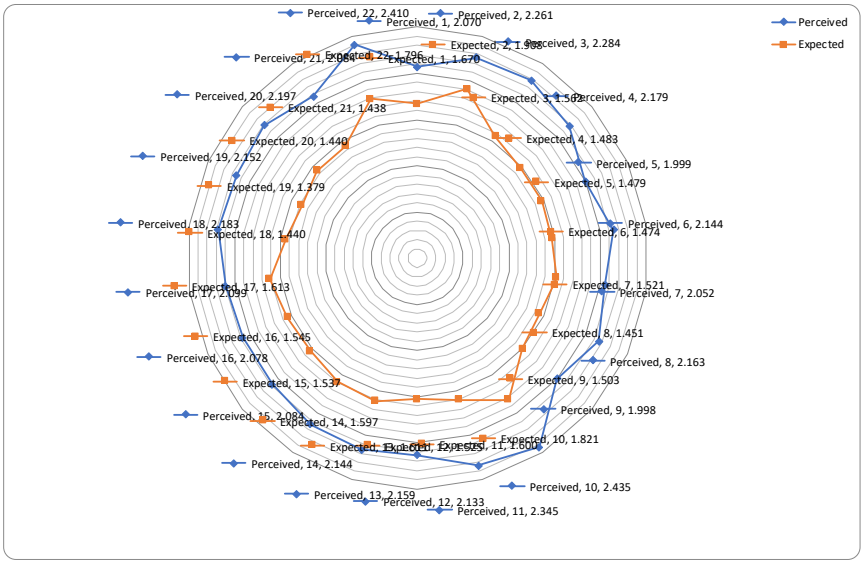

Figure 2: Difference between expected level and perceived level of service quality attributes

In order to examine whether this difference was statistically significant, an Independent Sample t-test was employed. The grouping variable was the status of the expected level or the perceived level. In grouping, group 1 was the perceived level (N=1791, Mean=171.13, SD=25.73) and group 2 was the expected level (N=1790, Mean=130.36, SD=30.72). Summated score of the responses was the outcome variable.

The Levene's Test for Equality of Variances showed that the *p-value* was significant ($p < 0.001$) indicating that the null hypothesis was not assumed and there was a significant difference between expected level and perceived level of service quality (M=40.77, BCa 95%

CI [38.92, 42.63]. Therefore, the difference between importance and satisfaction is statistically significant (t (1,790) = 43.053, p<0 001).

Importance-Performance Analysis of variables

As discussed above the mean and standard deviation of the aggregated data were considered to understand the importance and performance levels of quality attributes of the library. The dispersion of variable data on the IPA framework was investigated. Figure 3 indicates the falling pattern of the variables in the IPA matrix.

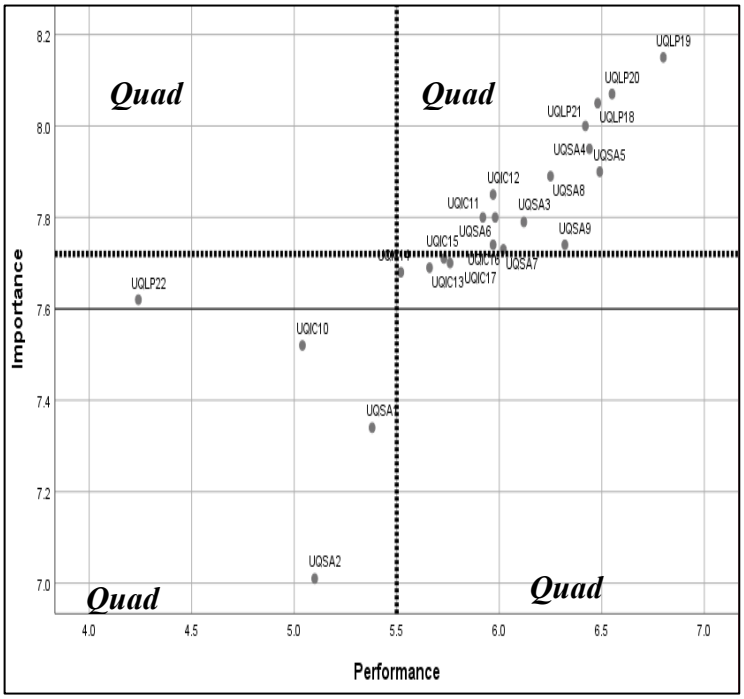

Figure 3: Distribution of Service Quality Variables in the IPA Matrix

According to the mapping of the variables on the IPA framework, no variables fell into quadrant I indicating that the university library system of Sri Lanka was not maintaining services that have high importance and low-performance characteristics.

Quadrant II represents the highly important and highly performed factors. According to Figure 3, variables UQLP19, UQLP20, UQLP12, UQLP18, UQSA4, UQSA5, UQSA8, UQIC12, UQIC11, UQSA3, UQSA9, UQSA6 and UQIC15 represent the quadrant II. This indicates that in the Sri Lankan university library context, service quality attributes viz. 'Availability of quiet space for individual activities', 'Availability of comfortable and inviting location of the library', 'Capability of the library as a gateway for study, learning or research', 'Availability of library space that inspires study and learning', 'Readiness of the staff to respond to my questions', 'Knowledge of the staff to answer my questions', 'Availability of

needed printed library materials for my work', 'Capability of the website to enable me to locate information on my own', 'Consistent courteousness of the library staff to me', 'Trustworthiness of the staff in handling my service problems', 'Caring fashion of the staff when dealing with me in the library' and 'User-friendliness of access tools to find things on my own' are highly important services and highly satisfied with the performance. Many of these attributes are related to the 'Library as a Place' dimension and the 'Service Affect' dimension of the LibQUAL protocol. These findings further revealed that the high demand is existing in the university libraries for a convenient place of learning as well as for the staff involvement in the user services. According to the results, users are satisfied with these services and the library management should continue these services with the same high level of performance.

Four quality attributes such as 'Availability of Community space for group learning and group study', 'Making electronic resources accessible from my home or office', 'Ability of library staff to instill confidence in me' and 'Ability of the library staff to pay individual attention to me' have been mapped in the Quadrant III implying that those attributes are neither highly important nor highly performed in the Sri Lankan university library context.

These findings imply an important message that users of the university library believe that they are confident in finding information on their own and they have different channels to access e-resources. They might obtain these information resources through sharing with peers or obtain them from outside contacts. They also may be fulfilling their needs for community activities from other places rather than from the library. These findings are important for library managers and they should not worry about them as these variables are not threats to the library and should thrive to improve other attributes.

The variables that fall into Quadrant IV have low importance and high performance. These attributes are not important for users and the library spends money and effort to maintain them without a profit. Therefore, library managers should think of dropping them and introducing new service attributes to users. According to the results, four service quality attributes viz. 'Easy accessibility to information for independent use', 'Ability of library staff to understand my needs', 'Availability of electronic information resources that I need' and 'Availability of print and/or electronic journal collections required for my work' are fallen into this category. However, they show some kind of importance and high performance because they are located very close to the mean and to the Quadrant II of the IPA Matrix.

Conclusion

This study attempted to investigate the importance and satisfaction of service quality attributes in the Sri Lankan university library context. The study was guided by three research questions to find out the gap between users' expected service quality and perceived service quality. Expected service quality represented the importance of service attributes and perceived level represented the satisfaction of the service attributes of the library.

The study results indicated that there was a significant gap between expected service quality and perceived service quality. This leads library professionals to think of strategies to minimize the service quality gaps in their libraries. The study utilized the IPA technique to map the importance and performance (satisfaction) of the library service variables in four quadrants matrix. This tool supports the library managers to identify important and non-important areas of the service quality in the libraries and identifying the satisfied and unsatisfied service attributes of the library.

The study was limited to 22 LibQUAL items to measure the service quality attributes. Future research may be focused to find more research attributes that emerged in the new situation and measure them through more robust tools.

The study has many implications. Theoretically, university library managers should rethink the applicability of LibQUAL items as they are for the evaluation of the library service quality in the contemporary environment. Methodologically library managers should find different methods and techniques to grasp the quality attributes rather than sticking to conventional methods. Practically library managers should evaluate the quality criteria of the library service from time to time so that they can ascertain the validity and applicability to the contemporary user requirements.

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EDUCATIONAL QUALIFICATIONS, TRAINING NEEDS AND CHALLENGES FACED IN HRM BY THE PUBLIC LIBRARY EMPLOYEES IN AMPARA DISTRICT, SRI LANKA

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Abstract

Human resources are considered as a backbone to the success of all organizations including public libraries. The objectives of the study are to examine the educational qualifications of the public library employees, identify their training needs and analyze the challenges faced by the public library staff members in the Ampara district. Self-administrated questionnaires were distributed among all staff members who work at public libraries in the Ampara district (n=130). Descriptive analysis was performed. The results revealed that majority of staff members had G.C.E Advanced level qualifications (Librarians-64.7%, Library Assistants-55.4% and other staff categories-51.4%). Further, highest percentage of Librarians hold Level 2 in Diploma in Library and Information Sciences (35.3%). However, majority of Library Assistants and other staff categories having certificate level competency in Diploma in Library and Information Science. It was noted that the majority of respondents usually attend training once a year, while a considerable percentage of the staff had never attended training for the last two years (2018-2020). The majority of the Librarians lack training on Library Automation (82.4%) and Basic computer skills/IT skills (70.6%). However, a significant amount of Library Assistants and other staff are interested to have training in Basic computer skills/IT skills (82%) and Library Management (72%). Additionally, not revising circulars in time, inadequate opportunities for training, lack of promotion, permanent cadres not filled by suitable persons, and work overload were identified as major challenges faced in HRM. The study recommends that library administrators and policymakers should implement immediate remedies to eradicate malpractices prevalent in public libraries.

Keywords: *Public library, Academic qualifications, Ampara District, Sri Lanka, Training*

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Introduction

In libraries, human resources are the most valuable asset. The effectiveness and success of the institution depend on human resources. ***"****Human resources are the set of the people who make up the workforce of an organization, business sector, industry, or economy"* (Armstrong, 2014; p.5). Educational qualification refers to the formal education attained by personnel at various levels. It is believed that highly skilled staff would render excellent services to the reading community. To be successful, public libraries need personnel with qualities and qualifications appropriate to libraries and information services. Pacheco & Escamilla (2015) stated that personnel must be sufficiently qualified to provide adequate services thus leading to efficient management of libraries. Goad (2002) stated that employees with higher educational qualifications perform better compared to those with lower academic qualifications. Similarly, Cook (2008) reported that recruiting personnel with required academic qualifications is an effective method of ensuring increased job performance.

Training is the systematic acquisition of the knowledge, abilities, and attitudes necessary for individuals to perform satisfactorily in a particular activity or job. Staff training and development can make a significant contribution to the overall effectiveness of an organization (Olaniyan & Ojo, 2008). To provide the best services to the community it is necessary to maintain well-trained and highly qualified staff. Without relevant and appropriate training, employees of an organization may fail to perform to their maximum level. Babalola (2014) pointed out that the higher the training attained, the higher the degree of intellectual exposure among librarians. Training and development, therefore, are of utmost importance in the library field, although each library organization must decide for itself what it means by a desired state of efficiency, as requirements will alter from library to library and country to country. However, the training and development should be designed to ensure efficient performance for the mutual benefit of the library system and the users. (Boateng & Lamptey, 2018).

Further, challenges faced by human resources are also an essential topic. As per the existing studies in Sri Lanka, there are many more challenges faced by library management related to promotion, recruitment of qualified staff, providing adequate training, etc. Moreover, some complaints from reliable sources in the Eastern Province also confirmed that still several malpractices are going on in the Eastern region. Further, grievances received by the Sri Lanka Library Association (SLLA) confirmed that recruitments and promotions are infrequent and irregular (Gamage, 2018). Therefore, this leads to work overload among employees and created unwanted obstacles in their workplace.

Therefore, the situation on the ground invites the study of human resources in public libraries in the Ampara district. This survey was intended to identify the academic qualifications, training needs and challenges of public library employees.

Objectives

1. To study the qualifications of the staff of public libraries in the Ampara district
2. To find out the training needs of staff
3. To examine the challenges faced by the staff in performing duties at library

Literature Review

Public libraries have been researched in a variety of manners. The literature review discussed the previous research conducted by several researchers on the educational achievement, training preferences and challenges faced by public library employees (Chandrasekar, 2013; Masroofa, 2021; Mbofung, 2015; Ravikumar & Ramanan, 2015; Wanasinghe, 2018). Usherwood *et al.* (2000) have conducted a study among all public library authorities in the United Kingdom. It discussed about four main areas such as recruitment, retention, training and leadership. Their findings revealed that nearly half of all authorities stated there were specific circumstances when they would appoint staff without a professional qualification to a professional post. Similarly, Wanasinghe (2018) pointed out that malpractices are adopted in recruiting staff and the library management needs to identify the lapses and follow immediate actions to recruit a qualified staff. Further, the researcher pointed out that the staff should be provided with promotions and proper training. Also, Fischer (2015) conducted a library survey and revealed that 40.79 percent of the libraries surveyed did not employ librarians with a Master's degree in Library Science. Even though this survey included larger populations and a wider cross-section of the country than surveys conducted by the previously mentioned researchers, 69.44 percent found it difficult to hire the right staff for the position. It is apparent that government libraries exposed in a threatening situation in terms of staffing in the United States. These findings stimulated the researcher to conduct a similar study in order to find the scenario in Eastern Province of Sri Lanka.

Masroofa (2021) conducted a study to investigate the status of Continuous Professional Development (CPD) of public librarians in the Ampara district and the factors influencing their continuous professional development that leads to professionalization. This study resulted that public librarians in this region have faced several types of hindrances in their professional development during the prevailing civil unrest for three decades on the island. This study

concluded that there is room for professional development of public librarians and necessary steps have to be taken to educate them, giving a good exposure to other library professionals and expertise, networking with other librarians and professional organizations.

Besides, Mbofung (2015) used a 5-point Likert scale to assess responsiveness to training in his study on maintaining library employees of the future among library workers in Nigerian universities. The majority of respondents thought that training was an effective way to promote professional practice and avoid stagnation. Additionally, the results indicated that library employees acquired skills in problem identification, problem analysis, and identification of development needs through training. Significantly more respondents stated that the training they received was valuable. As a result, well-designed training programs efficiently guide libraries toward their goals. Therefore, determining perceived training needs and the frequency of attending needs to be investigated.

The challenges associated with the human resources capital of public libraries were analyzed by several researchers in Sri Lanka (Chandrasekar, 2013; Ravikumar & Ramanan, 2015; Wanasinghe, 2018). Chandrasekar (2013) undertook a study to ascertain the difficulties confronting public libraries in Jaffna district, Sri Lanka. The researcher identified the major challenges encountered by the public libraries which include the dearth of professional and personal competencies among library staff, poor participation in Continuous Professional Development (CPD) programs, lack of interest and motivation from authorities, and absence of library cooperation. Further, it was pointed out that Community centre libraries were forced to be managed by personnel lacking professional competencies in the field of library science. As a result, the public received substandard services. Wanasinghe had reported similar findings in 2018 as well. Additionally, the investigation discovered that there has been no recruitment or promotion of public library workers in North Central Province in the last fifteen years. Ravikumar & Ramanan (2015) conducted a study in selected public libraries in the Batticaloa district. The main objective of this paper is to identify the obstacles faced by the public libraries in Batticaloa district in automating their library functions and to provide possible solutions to overcome these obstacles with their existing minimum resources. They stated that public libraries face a severe shortage of personnel with the required competency with respect to library management.

Finally, a review of literature on human resources involving public libraries found that research related to this topic was minimal for the Eastern Province, Sri Lanka. Existing reports mostly cover issues related to challenges and constraints faced by Sri Lankan public libraries. Therefore, it suggested that there is a need to identify the present status of library personnel in

terms of qualification and examine the challenges associated with delivering quality service to the general public.

Research Methods

Current study is a research of quantitative nature and a self-administrated questionnaire was used to collect data from all staff of public libraries in Ampara district, Sri Lanka. A total number of 130 public library employees were invited and 117 employees had responded which resulted the response rate of 90%. The educational qualifications, training needs and challenges were analyzed. Descriptive analytical techniques were performed. SPSS version 24 software was used to analyze the collected data.

Results and Discussion

The findings from descriptive statistics regarding the designation of the employees indicated that there were 17 (14.6%) Librarians, 65 (55.5%) Library Assistants, and 35 (29.9%) other categories of staff, working in public libraries in the Ampara district. They were contacted from 44 public libraries in the Ampara district.

Qualifications of the Respondents

Findings indicated that the majority of public libraries in Ampara district are managed by Library Assistants. Even though there were 44 libraries, few libraries (20) are managed by designated Librarians.

As shown in Table 1, a significant number of Librarians having G.C.E. Advanced level educational qualification was around 64.7%. However, small percentage (5.9%) holds PG Diploma qualification.

Regarding the Librarians' professional qualifications, the highest percentage of them had completed Level 2 in Diploma in Library and Information Sciences (35.3%).

Besides, 55.4% of the Library Assistants acquired G.C.E. Advanced level qualification as per the Table 1. However, majority of the Library Assistants had completed certificate level courses in Library and Information Sciences which was around 43.1%. Sri Lanka Library Association (SLLA) is offering the Higher Diploma in Library and Information Science which is offered as three levels. Those who complete Higher Diploma in Library and Information Science are eligible to register as Non-corporate members of SLLA. Therefore, public library employees are encouraged to complete the required qualifications in Library and Information Science in order to entertain more benefits.

Table 1: Qualifications of Respondents

Qualifications		Librarians	Library Assistants	Other staff Categories
Educational qualification	O/L and below	3 (17.6%)	29 (44.6%)	15 (42.9%)
	A/L	11 (64.7%)	36 (55.4%)	18 (51.4%)
	Bachelor degree	2 (11.8%)	-	2 (5.7%)
	PG Diploma	1 (5.9%)	-	-
Professional qualification	Certificate	2 (11.8%)	28 (43.1%)	13 (37.1%)
	Dip L 1	4 (23.5%)	7 (10.8%)	2 (5.7%)
	Dip L 2	6 (35.3%)	3 (4.6%)	1 (2.9%)
	Dip L 3	4 (23.5%)	8 (12.3%)	1 (2.9%)
	Not applicable	1 (5.9%)	19 (29.2%)	18 (51.4%)

Training Needs of Employees

The findings of the training needs by librarians revealed that the majority of the staff wish to attend training in Library automation and Basic computer skills/IT skills which were 82.4% and 70.6%, respectively. Nevertheless 82% and 72% of the Library Assistants are interested to have training in Basic computer skills/IT skills and Library Management, respectively. However, more than 50% of the Library Assistants and other staff categories preferred to attend training on Library automation, Indexing of library materials, Cataloguing of library materials, and Classification of library materials according to Table 2 are given below. As per the findings, it is evident that relevant authorities should take necessary arrangements to design training programmes in requested fields to improve the competencies of the public library employees in the Ampara district. This is one of the prime duties of the Academic librarians as well.

Table 2: Training needs of Library employees

Training needs	Librarians	Library Assistants and other categories
Library automation	14 (82.4%)	51(51%)
Cataloguing of library materials	6 (35.3%)	56 (56%)
Classification of library materials	6 (35.3%)	57 (57%)
Indexing of library materials	9 (52.9%)	51(51%)
Basic computer skills/IT skills	12 (70.6%)	82 (82%)
Library management	7 (41.2%)	72 (72%)

Table 3 denotes the frequency of attending training by library staff. It was observed that 68% of the Library Assistants and other staff and 76.5% of the Librarians attend training once a year. It is very pathetic that a considerable percentage of Library Assistants and other categories never attended training for last 2 years. Therefore, the online training session is highly recommended to avoid issues in arranging face-to-face training sessions to enhance the skill and knowledge.

Table 3: Frequency of attending training

Duration	Librarians	Library Assistants and other Categories
3-4 times per year	4 (23.5%)	9 (9%)
Once a year	13 (76.5%)	68 (68%)
Never attended for the last 2 years	0	23 (23%)

Challenges Faced by the Employees of Public Libraries in HRM

The participants were requested to rate the challenges in human resource management faced by employees in performing their duties using a five-point Likert-type scale, ranging from Strongly Disagree to Strongly Agree. The mean values and standard deviation were recorded. The staff reported that lack of promotion, work overload, not revising policy, rules, regulations and circulars, not filling permanent cadres with suitable persons and inadequate opportunities for training were their main challenges as the mean values were greater than 3.5 as indicated in Table 4.

Table 4: Challenges faced by Library employees

	Human Resource Challenges	Mean	Std. Deviation
1	Lack of promotion	3.62	0.981
2	Permanent cadres not filled by suitable persons	3.90	1.145
3	Negligence of library staff by higher authorities	3.06	1.029
4	Circulars are not revised	3.89	0.88
5	Inadequate opportunities for training	3.97	0.800
6	Work overload	3.84	1.01

Mean > 3.50 = considered as challenge

Conclusion

There were 17 Librarians, 65 Library Assistants and 35 other staff categories from 44 libraries participated in the present study. The findings indicated that majority of staff members had G.C.E Advanced level qualification (Librarians- 64.7%, Library Assistants- 55.4% and other staff categories-51.4%). In terms of professional qualifications, highest percentage of Librarians are having Level 2 in Diploma in Library and Information Sciences (35.3%). Nevertheless, majority of Library Assistants and other staff categories having certificate level competency in Library Science.

The results indicated that the highest percentage of respondents attend training once a year, while a few percent of the Library Assistants and other staff categories never attended training for the last two years. The majority of Librarians preferred to have training in Library automation and Basic computer skills/IT skills. However, a considerable percentage of the Library Assistants and other staff categories required training in Basic computer skills/IT skills and Library management.

Not revising Circulars in time, inadequate opportunities for training, lack of promotion, not filling permanent cadres by suitable persons, and work overload were identified as major challenges faced in HRM by public library employees in Ampara district.

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OCCUPATIONAL STRESS AMONG LIBRARY EMPLOYEES OF THE UNIVERSITY OF KELANIYA

M. P. L. R. Marasinghe[1], A. P. U. de Silva[2] and R. A. A. S. Ranaweera[3]

Abstract

The occupational stress of an employee is a significant challenge to the productivity of a workplace. The study was aimed at identifying occupational stress and the relationship between role ambiguity, role conflict, and work environment. A survey was designed to collect data using a closed-ended questionnaire. All paraprofessionals, supportive staff, and administrative staff of the main library, and the library of the faculty of Medicine, University of Kelaniya were considered as the population of the study. The population size was 66. The data were analyzed using descriptive statistics using SPSS software (v. 22). The response rate was 100%, and the male: female ratio was 34 (51.5%): 32 (48.5%). The findings on occupational stress revealed that the majority had challenges with inadequate monthly wages, traveling from residence to workplace, inadequate ICT knowledge and skills, and the nature of the work. Most library employees did not have issues with role ambiguity; however, they faced difficulties with the work environment, i.e., poor ventilation, poor lighting and temperature, not having a well-designed workplace, and an unpleasant environment. Working with insufficient resources and inadequate IT facilities has become a significant challenge for library employees. There was a significant positive correlation between occupational stress and role conflict. Library management should deal with the possible factors and sources that will create occupational stress for library employees to improve their psychological well-being.

Keywords: *Occupational stress, Library employees, University, Sri Lanka*

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Introduction

Occupational stress has been identified as one of the critical concepts of employees' responses to their work setting. The term 'stress' has connections to biological, behavioral, physical, and medical sciences subject domains (Ugwuanyi & Ugwu, 2010). Stress is simply known as a subjective and anxiety-based syndrome, and it manifests differently from one person to another. Hence, it is rather difficult to provide a stereotype definition for it (Onyia, 2016). The occupational stress of employees has a direct impact on their work performance and productivity. Work-related stress can bring several disadvantages to the life of an employee by disturbing his or her physical or mental health, or both. It is also associated with organizational challenges and phenomena such as absenteeism, burnout, hypertension, and poor job performance (Agyei et al, 2019). Hence, occupational stress or job stress is identified as one of the key factors of employee well-being as well as the overall performance of an organization in general.

Over the past few decades, the library profession has been recognized as a non-stressful job (Petek, 2018). However, the socio-economic and technological changes around the world have made their traditional role much more challenging and complex. Simultaneously, these changes led to drastic changes in the higher education sector as well. With these new changes and trends, academic or university libraries also change their role to keep pace with the growing and constantly changing demands of the users related to teaching and research context. The growing user demands, dynamic nature of information, budget constraints, inadequate infrastructure, new technological applications, and career progressions have brought considerable changes to the work lives of library professionals (Akakandelwa & Jane, 2013; Amusa et al, 2013;Dina, 2016; Oniya, 2016). These rapidly changing factors may increase the work pressure on the library staff and force them to come up with their maximum output. At the same time, it may enhance both the work competence and job stress among the staff. Consequently, the job stress could frustrate the staff of the library (Ilo, 2016). Therefore, it is important to study the stress levels of the library staff. A considerable volume of studies has been conducted to study the level of occupational stress among university library employees over the world.

Devi & Lahkar (2021) identified that library professional job stress reached a moderate level recently. The studies also revealed that the library profession had become a stressful job category in the present era due to the patrons and colleagues, new technology, budget cuts, and low status accorded to the profession, etc. (Nawe, 1995; Iroka, 2011; Onyia, 2016; Petek, 2018). Career development in libraries, quality of work, organizational culture and work

environment, workers' relationships at work, and workers' personality characteristics have become critical factors of job stress in library professions (Ugwuanyi & Ugwu, 2010; Onyia, 2016). Studies also have been conducted to determine whether gender could be a factor influencing occupational stress among librarians.

The factors such as salary, benefits, rewards, workload, working with senior staff members, role ambiguity, role conflict, budget cuts, work environment, new technology, and low status accorded to the profession have been identified as significant sources of job stress at the workplace (Mutiu, 2011; Ikonne, 2015; Devi & Lahkar, 2021). The study conducted by Ikonne (2015) considered role ambiguity, role conflict, and work environment as the primary sources affecting the job stress of library employees and revealed that there was a strong positive correlation between the three factors that are role ambiguity, role conflict and work environment, with the psychological well-being. Studies also have revealed that there was a relationship between job stress and both life satisfaction and job performance among the non-academic staff of the library (Mutiu, 2011; Devi & Lahkar, 2021).

In the university library context in Sri Lanka, only one study (Wijetunge, 2012) has been conducted focusing on the job stress of library employees. It examined the level of stress among the university librarians and revealed that most librarians were at a medium level of stress. There was no evidence of research on job stress or occupational stress of other library employees except the librarians/academic staff from other universities in Sri Lanka. Therefore, this study is vital to fill this gap and have a comprehensive insight into occupational stress related to the non-academic and administrative staff of the library at the University of Kelaniya. The main objective of the study was to investigate the occupational stress of non-academic and administrative staff of the main library, and the library at the faculty of medicine, University of Kelaniya. There were four specific objectives in this study; to identify the sources of occupational stress of the library employees; to determine the factors of role ambiguity affecting the occupational stress of the library employees; to determine the factors of role conflict affecting the occupational stress of the library employees; to determine the factors of the work environment affecting the occupational stress of the library employees.

Methodology

The study adopted the survey research strategy to investigate the occupational stress of the library staff in the main library and Medical Faculty of the University of Kelaniya. All administrative, paraprofessional, and supportive staff members of the main library and the

library at the Faculty of Medicine, University of Kelaniya, were considered as the population of the study (N=66).

Data collection:

A closed-ended questionnaire was developed based on the literature (Manshor et al., 2003; Mutiu, 2011; Ikonne, 2015). The questionnaire was designed using Google Forms, and it was comprised of 40 questions, considering five main sections namely; demographic information (six questions), sources of occupational stress (ten questions), factors of role ambiguity (seven questions), role conflict (eight questions), and work environment (nine questions). All the participants were interviewed and received feedback based on the questionnaire developed. The responses were collected from all the participants.

Data Analysis and Results

Data Analysis

Data collected from the questionnaires were received in spreadsheets of the Google form and it was saved into an Excel sheet. The data was transferred into SPSS software (version 22). The values were allocated from 1 – 5 for all questions which were assessed by a five-point Likert scale with the responses (1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree, 5=Strongly Disagree). The negatively worded statements on occupational stress were awarded points in reverse order. The socio-demographic data was also entered into the same database. The data were analyzed using descriptive statistics; frequencies, percentages, mean, and standard deviation. Pearson correlation was computed to assess the relationship between occupational stress and each of the factors; role ambiguity, role conflict, and work environment separately.

Results

The demographic characteristics are mentioned in Table 1. The response rate was 100% (n=66). The male: female ratio was 34 (51.5%): 32 (48.5%).

Table 1: Demographic Characteristics of the Library Employees

Characteristics		Frequency (N)	Percentage (%)
Age (years)	20-30	7	10.6
	31-40	24	36.4
	41-50	19	28.8

	> 50	16	24.2
Gender	Male	34	51.5
	Female	32	48.5
Civil status	Married	54	81.8
	Single	12	18.2
Designation	Administrative Staff	1	1.5
	Paraprofessional staff	39	59.1
	Supportive staff	26	39.4
Work Experience	< 5	19	28.8
	5-10	8	12.1
	11-15	14	21.2
	16-20	5	7.6
	21-25	6	9.1
	> 25	14	21.2
Section of the library	Main Library	57	86.3
	Library, Faculty of Medicine	9	13.6

The response rates for specific sources of occupational stress by all participants were summarized in Table 2. Monthly wage (74.2%) and traveling (50.0%) were indicated as the most influential factors for the occupational stress of most employees. Other challenges of occupational stress were; inadequate ICT Knowledge & skills (27.2%), nature of the work (25.8%), issues in communication with co-workers (16.7%), and communication issues with senior academic staff (13.6%), and inadequate support from the members of the group (10.6%). Workload (9.1%), insufficient support from senior management (6.1%), and tight demands from the academic staff members (4.5%) were seen to be the least occupational stress factors.

Table 2: Response Rates for Occupational Stress

No.	Statement	Rating by the Respondents (%)				
		Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1	Inadequate ICT Knowledge & skills	3.0	24.2	21.2	47.0	4.5
2	Nature of the work	-	25.8	7.6	63.6	3.0
3	Issues in communication with co-workers	1.5	15.2	13.6	68.2	1.5

4	Issues in communication with senior academic staff	-	13.6	9.1	75.8	1.5
5	Tight demands from the academic staff members	-	4.5	19.7	74.2	1.5
6	Workload	-	9.1	15.2	66.7	9.1
7	Inadequate support from the members of the group	-	10.6	4.5	80.3	4.5
8	Inadequate support from the senior management	-	6.1	7.6	81.8	4.5
9	Inadequate monthly wage	21.2	53.0	10.6	13.6	1.5
10	Problems in traveling from residence to workplace	19.7	30.3	13.6	34.8	1.5

The participants' view on role ambiguity factors of occupational stress is summarized in Table 3. Almost all of the respondents (98.5%) were well aware of their duties and responsibilities. 98.5% of respondents were aware of the level of authority, and 96.9% of respondents were capable of working at the same rate in any working group. 92.4% of the participants had a clear picture of what others expected from them, 90.9% of them were able to manage time to do their work efficiently, and 90.9% of them were aware of the evaluation process for promotion. However, 75.8% of the participants responded that they had well-planned their career development.

Table 3: Response Rates for Role Ambiguity

No.	**Statement**	**Rating by the Respondents (%)**				
		Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1	I am not well aware of my duties and responsibilities.	-	1.5	-	77.3	21.2
2	I do not know the level of authority/capacity I have.	-	1.5	-	86.4	12.1
3	I do not have a clear idea of what others expect from me.	-	-	7.6	83.3	9.1
4	I cannot manage time very well to do my work efficiently.	-	1.5	7.6	78.8	12.1

5	I am not aware of the evaluation process for promotion.	-	4.5	4.5	83.3	7.6
6	I feel that I cannot work at the same rate in any working group.	-	1.5	1.5	84.8	12.1
7	I do not have well plan for career development.	-	7.6	16.7	68.2	7.6

The participants' views on the factors of role conflict of occupational stress were summarized in Table 4. It was revealed that 47% of the participants were assigned to work with insufficient resources, 43.9% had to perform their duties alone without assistance, and 28.8% of them requested contradictory work from more than a single person. 25.7% of the participants responded that some people in the same workplace did not accept the work done by them. 22.7% answered that they had many responsibilities and were beyond their capacity. However, 75.7% and 75.8% disagreed on working under ambiguous ways and orders and facing workplace harassment, respectively. Most respondents had flexible work hours and sufficient breaks (83.4%).

Table 4: Response Rates for Role Conflict

No.	**Statement**	**Rating by the Respondents (%)**				
		Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1	I am assigned to do work with insufficient resources.	6.1	40.9	15.2	37.9	-
2	I have to do some duties alone without any assistance.	1.5	42.4	15.2	39.4	1.5
3	I am requested contradictory works from more than two persons.	1.5	27.3	10.6	57.6	3.0
4	I have many responsibilities that are beyond my capacity.	-	22.7	15.2	62.1	-
5	I have to work under ambiguous ways and orders.	-	19.7	4.5	72.7	3.0
6	Some people do not accept some works that I do.	1.5	24.2	6.1	65.2	3.0
7	I have to face workplace harassment.	3.0	15.2	6.1	65.2	10.6

8	I do not have flexible work hours and sufficient breaks.	-	10.6	6.1	75.8	7.6

The participants' view on factors of work environment is indicated in Table 5. The results revealed that the majority were working in a poor work environment, i.e., poor ventilation (48.5%), poor IT facilities (47%), poor lighting (34.9%), and inadequate materials and equipment (34.8%). Poorly designed workplace (33.4%) and unbearable temperature in the workplace (30.3%). 27.2% of the participants responded that there was an unpleasant work environment. However, the majority indicated that they have physically safe working places (83.4%) and a calm working atmosphere (83.4%).

Table 5: Response Rates for the Work Environment

No.	Statement	Rating by the Respondents (%)				
		Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1	Poor lighting	7.6	27.3	7.6	54.5	3.0
2	Poor ventilation	10.6	37.9	4.5	42.4	4.5
3	Unbearable temperature (Cold or hot)	12.1	18.2	19.7	45.5	4.5
4	Unpleasant environment	3.0	24.2	7.6	57.6	7.6
5	Insecure physical environment	1.5	10.6	4.5	75.8	7.6
6	Much disturbance (e.g., noise, people)	-	7.6	9.1	77.3	6.1
7	Inadequate materials & equipment	3.0	31.8	16.7	47.0	1.5
8	Poor IT facilities	10.6	36.4	31.8	21.2	-
9	Not well-designed workplace	7.6	25.8	18.2	42.4	6.1

By considering the mean and standard deviation (SD) of each variable as shown in Table 6, the level of occupational stress of library employees was closer to the average level. Recognizing the occupational stress dimension was very low from role ambiguity and closer to the average level from role conflict and work environment.

Table 6: Mean and SD of the Variables

Variable	Mean (SD)
Occupational stress	3.3894 (0.42684)
Role ambiguity	4.0108 (0.28051)
Role conflict	3.3788 (0.49321)
Work environment	3.2374 (0.62699)

According to the results mentioned in Table 7, there was not a significant correlation between occupational stress and role ambiguity. The strength of the correlation between these two variables was very weak and positive.

Table 7: Correlations between Occupational Stress and Role Ambiguity

		Occupational Stress	Role Ambiguity
Occupational stress	Pearson Correlation (r)	1	0.148
	Sig. (2-tailed)		0.236
Role ambiguity	Pearson correlation (r)	0.148	1

The results in Table 8 revealed that there was a significant positive correlation between the occupational stress and role conflict as the correlation is significant at the 0.01 level (2-tailed). The strength of the correlation between these two variables was moderate and positive.

Table 8: Correlations between Occupational Stress and Role Conflict

		Occupational stress	Role conflict
Occupational stress	Pearson Correlation (r)	1	0.580**
	Sig. (2-tailed)		0.000
Role conflict	Pearson Correlation (r)	0.580**	1

**. Correlation is significant at the 0.01 level (2-tailed).

There was not a significant correlation between occupational stress and work environment as shown in Table 9. The strength of the correlation between these two variables was very weak and positive.

Table 9: Correlations between Occupational Stress and Work Environment

		Occupational Stress	Work Environment
Occupational stress	Pearson Correlation ®	1	0.155
	Sig. (2-tailed)		0.213
Work environment	Pearson Correlation ®	0.155	1

Discussion

Inadequate monthly wage and issues in traveling from residence to workplace were the significant factors that influenced occupational stress. In addition, the inadequacy of ICT knowledge and the skills, and nature of the work were the moderate stress factors for occupational stress of the library staff, while the other factors were identified as the least stress factors for occupational stress.

Bivariate (Pearson) correlation was used in the analysis of this study as it measures the strength of the linkage between two continuous level variables called "Pearson's r" or "Pearson product-moment correlation coefficient"(Zou et al., 2003). Studies have investigated a significant correlation between occupational stress and each factor; role ambiguity, role conflict, and work environment (Ikonne, 2015). However, in this study, the results indicated a significant positive correlation between occupational stress and role conflict, while there was no significant correlation between occupational stress and each of the factors; role ambiguity and work environment.

Results indicated that issues regarding role ambiguity of the library employees were comparatively low and recognizing the dimension of occupational stress from role ambiguity was lower than role conflict and work environment. It was determined by considering both the mean values for each variables and response rates (five-point Likert scale). In this study, library employees have faced difficulties performing duties, especially with insufficient resources and poor IT facilities. Studies also have investigated the challenges and problems with information technology was one of the main occupational stressors of library employees (Prabhakaran & Mishr, 2012; Babatope, 2013). The workplace environment was also affecting the occupational stress of library employees as reported in some studies (Aldwin, 2007; Ajala, 2011). In this study, most of the library staff were not satisfied with some factors of the work environment, i.e., ventilation, lighting, adequacy of materials and equipment, temperature, arrangement, and pleasantness of the workplace.

Therefore, the occupational stress of work employees should be minimized to increase the quality of the service. If the employees in any organization work with good psychological well-being, they tend to be more motivated and efficient, and it will increase productivity (Iroka, 2011; Ilo, 2016).

Conclusions & Recommendations

The occupational stress of administrative and non-academic staff in the main library and library at the medical faculty, University of Kelaniya was influenced by several factors and sources. There was no significant relationship of occupational stress between role ambiguity and the work environment. There was a significant positive relationship between occupational stress and role conflict.

Library management should deal with the possible factors and sources that will create employees' stress and take necessary actions to minimize occupational stress and improve their psychological well-being. Providing adequate facilities such as IT facilities, materials, and equipment, ventilation, lighting of the work area, etc., is essential to perform maximally. Training programs should be conducted to enhance the ICT knowledge and skills of the employees in the library in various aspects to eliminate the stress associated with changes in technology.

The library administrators should pay attention to cultivating positive attitudes of the library employees to enhance their psychological well-being to increase productivity. Evaluation of working conditions that create occupational stress is vital for the library's intervention programs to minimize employees' occupational stressors.

Future Research Implications:

It would be more effective to conduct a similar type of research by capturing a greater sample size of library employees from all other universities in Sri Lanka and doing a comparative study among universities. It would also be important in determining how work stress affects the job satisfaction and burnout of the employees in the library in the university sector. This study could be repeated to do a comparative study between the academic and non-academic staff of the library and other academic and non-academic staff in other sectors of the university system.

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A STUDY OF THE EFFECT OF RELATIVE HUMIDITY ON THE PHYSICAL DETERIORATION OF PAPER MATERIALS IN LIBRARIES IN THE TROPICS

Udaya Cabral[1]

Abstract

The article reveals the effect of relative humidity on deteriorating paper. A study was undertaken using three types of paper samples, exposing them to two levels of relative humidity, i.e., 50% and 80%. To gain knowledge of the condition of paper in the future, artificial ageing was done. A comparison was made using a control sample. Analysis was done using different testing methods, namely Folding Endurance, Tensile Strength, and Colorimetry for studying physical deterioration of paper materials. Tables, graphs, and figures indicate a very clear picture of the effect of relative humidity on deteriorating paper. It has been demonstrated that high humidity accelerates physical deterioration due to mechanical strength loss, with swollen matrices allowing greater absorption of acid and oxidants and providing colour indications of aged samples using colorimetry. Hence, high humidity, which is common in tropical climates, affects paper-based library materials in Sri Lanka.

Keywords: *Deterioration of paper, Relative humidity, Paper analysis, Libraries in tropics*

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Introduction

Sri Lanka is situated closer to the equator, in the south-west of the Indian peninsula, in the Indian ocean, between latitudes 5º 55' and 9º 51' N and longitudes 79º 41' – 81º 54' E. The location creates the tropical environmental conditions in the country. Sri Lanka has about 5000 mm of rain annually. Although Sri Lanka is small in size, with only 65,610 km^2 of land, it has significant variation in climate and topography. The annual temperature and humidity may vary according to the climatic zones. Due to the location, seasonal monsoon rain patterns and the country's being an island, the entire country has high relative humidity, an average of around 80% notwithstanding climatic zones.

It is obvious that paper-based library materials are the major information sources in the Sri Lankan libraries. The majority of libraries, particularly public and school libraries, lack proper environmental control systems for storing library materials in standard conditions in the exciting tropical climate. The paper materials from different origins may be badly affected by the prevailing environmental conditions in the country. This experiment was designed to identify the deterioration of paper materials stored in libraries without controlled environmental conditions. The main objective of the study was to identify the physical changes of paper materials stored in libraries without proper environmental control. The other objective was to identify the physical changes of different paper materials exposed for a long time to the exciting humidity conditions in Sri Lanka.

Materials and Methods

1) Artificial Ageing of Samples

An artificial ageing process is used to speed up the deterioration process of a particular object and provide valuable information on its characteristics that is important for future prediction of the permanent of the object. Experiments were set up to evaluate the physical deterioration processes in paper with respect to a relative humidity (RH) of 80%, which is the average RH condition in Colombo. Hence, the two experimental setups were performed at the recommended relative humidity for paper, 50 % and the average humidity level in Colombo, 80%. The experiment was carried out at the laboratory of the National Research Institute of Cultural Heritage (NRICH) in South Korea. Generally, the higher the temperature, the more quickly the chemical actions take place (Porck, 2000). Therefore, the temperature levels were adjusted to 80°C in both cycles to accelerate the ageing process. The samples (70 gsm acid

paper, 70 gsm copy paper and 70 gsm alkaline paper) were positioned in the artificial ageing chamber, keeping machine direction vertically and anchored at the top to avoid touching them together. Control samples were placed at room condition (South Korea), which is 20°C ± 3 temperatures and 50% ±5 relative humidity (optimum condition for paper records). The samples were artificially aged for 7 days in associated environmental systems (TH-ME/PE-025/065/100). The samples were equilibrated for 24 hours at 20°C ± 3 temperature and 50% ±5 RH after the ageing process. Then samples were tested to detect the physical changes due to artificial ageing.

2) Evaluation of Physical Deterioration

In high humidity conditions, the physical properties of the paper may change and speed up the deterioration process of paper materials.

i. ***Folding Endurance Analysis***

The Folding Endurance Tester measures the ability of a paper to maintain its strength after repeated folding. In order to evaluate the folding endurance with humidity, paper samples were analysed by the Toyoseiki MIT Folding Endurance Tester. The test was carried out according to ISO 5626:1993, Paper—Determination of folding endurance.

ii. ***Tensile Strength Analysis by Zero Span Tester***

The test was carried out according to the paper and board ISO 6588-1981(E) constant rate of elongation method. A horizontal load was applied to the paper strips in the machine direction. Ten specimens of each sample were measured.

iii. ***Colorimetric Analysis***

In order to evaluate the colour of the paper samples in high relative humidity, colorimetry was performed with an ELREPHO–Lorentzen and Wettre Optical Meter using L*a*b* notation. The instrument was calibrated against a white standard tile. The instrument was set for a 10˚ observer. The small area of view (1/4-inch diameter) was used, and specular reflectance was included. Spectras were recorded from 375 nm to 750 nm, using a visible light source, at five different locations on each side of each paper sample. Ten samples (10 x 10 cm) from each paper were tested, and readings were averaged.

To determine the change of the colorimetric values with moisture contents the changing rate of each value was calculated as follows,

Change Rate (CR) = (100% - In) x (Av)/In

In =Initial colorimetric value of the sample before ageing

Av = Colorimetric value after ageing

Results and Discussion

1) Folding Endurance Analysis

Folding Endurance is an indicator of a condition of paper and it measures the durability of paper. It increases by the high contents of fiber, long fiber, fillers and sizing. Monitoring of strength may help to determine the deterioration rate of the paper. Normally Folding Endurance is very sensitive to relative humidity changes. A small change of relative humidity can cause a large change in Folding Endurance. Hence, Folding Endurance test is very important to determine the effects of relative humidity towards the permanence of paper (Table 1). Figure 1 illustrates that the Folding Endurance decreased with the increase of relative humidity. Decrease of Folding Endurance can be resulted due to short fiber length, inadequate fiber bonding, or brittleness. As a rule, papers made out of rag pulps shows high Folding Endurance, whereas ground wood papers and papers with heavy fillers show poor Folding Endurance (Caulfield & Gunderson, 1988).

Table 1: Average Folding Endurance of Paper Samples in Two RH Conditions

	Copy Paper No. of double folds	**Filter Paper No. of double folds**	**Acid Paper no. of double folds**
Control	38.87	47.71	125.63
50% RH	31.25	38.42	68.25
80%RH	30.87	26.42	66.5

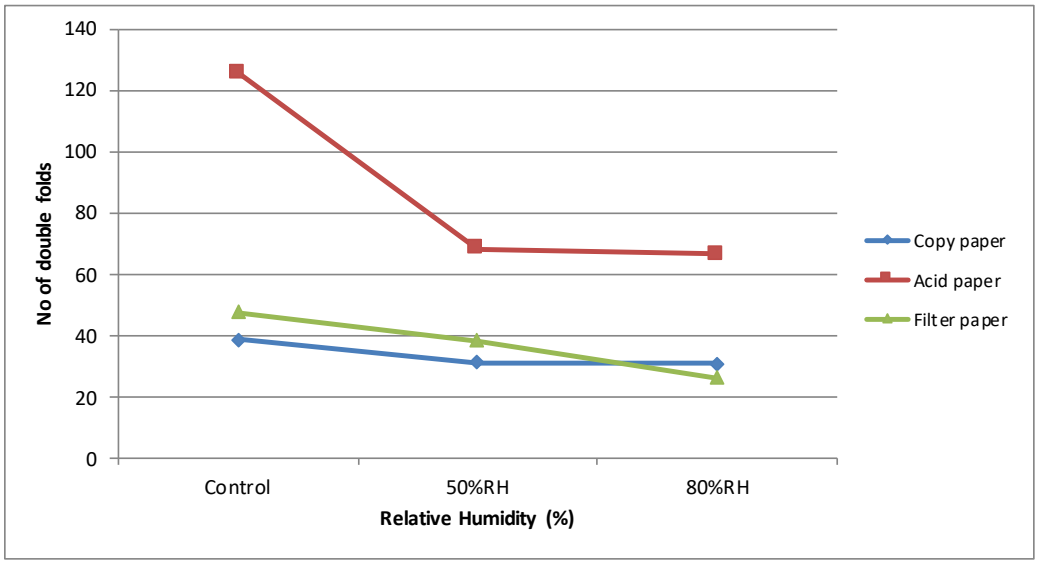

Figure 1: Folding Endurance of Paper Samples in Two RH Conditions

2) Tensile Analysis by Zero Span Tester

Page in 1969 submitted a scientific theory to assess the tensile property of paper. He explained the paper's strength is created by the contribution of individual fiber strength and inter bonding forces of the fibers. The jaws of the tensile tester are placed as close as possible to each other, that is, with zero separation. The principle behind the zero-span tests is that the individual fiber span the gap between the jaws, and the tensile breaking strength indicates the fiber strength as opposed to bond strength (Caulfield & Gunderson, 1988).

As the humidity increased, the breaking stress decreased slightly only on acidic paper, and the other two samples showed complicated reactions at RH 50%. Copy paper showed better physical strength after ageing at RH 50%. All samples showed a significant decrease in tensile strength at RH 80% (Figure 2).The rate of loss of mechanical properties with increasing relative humidity can be interpreted. A sample aged at a low relative humidity level would have low moisture content and therefore a less swollen matrix, which would be less accessible to acids and oxidants.

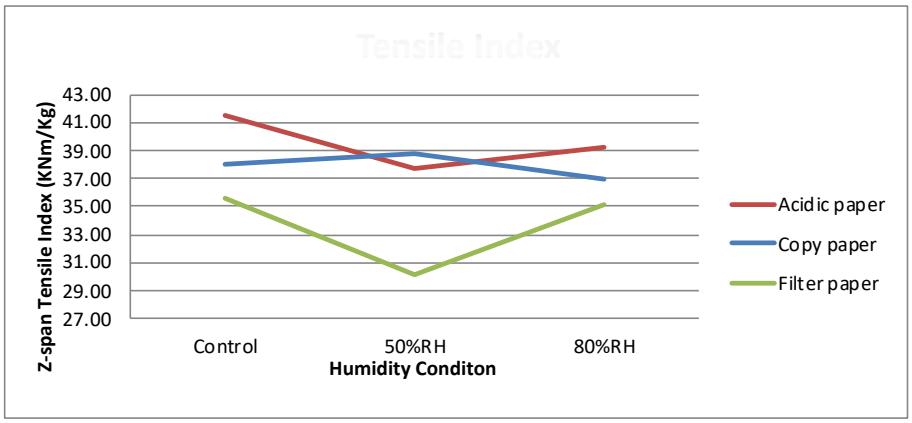

Figure 2: Tensile Indexes of Paper Samples

3) Colorimetric Analysis

The L∗ value shows the degree of whiteness (positive numbers) or the degree of blackness (negative numbers). Humid oven ageing caused a significant darkening (decrease in L*) of all samples. Acid paper recorded the highest rate. (Table 2), (Figures 3, 4). The a∗ value shows the degree of redness (positive numbers) or the degree of greenness (negative numbers). All a* values decreased with the high moisture content. The acid paper shows the greatest decrease. All paper samples increased in discoloration with the increase in relative humidity. They slightly turned greenish (Figure 5), (Figure 6).

b∗ value shows the degree of yellowness (positive numbers) or the degree of blueness (negative numbers). Acid paper has increased the b*value with the moisture and the colour has turned slightly yellow. The other two samples showed the opposite reaction and the colour slightly shifted to blue with high relative humidity (Figures 7) increased the b* value and decreased the L* and a* indicates the highest deterioration rate of acid paper when comparing the other two samples. The large increases in a* and b* upon humid oven ageing indicate that major increases in the amounts of red and yellow-absorbing chromophores .The colour differences (ΔE*) were calculated with the following equation:

$$\Delta E^* = [(\Delta L^*)\,2 + (\Delta a^*)\,2 + (\Delta b^*)\,2]1/2$$

The measurement of the optical properties: the ΔE* value is indicative of the chromatic alteration of paper materials. As shown in Figure 8 acid paper suffers an intense chromatic alteration when subjected to ageing at different humidity levels in a climatic chamber.

All most all the paper samples became progressively darker (-ΔL*) slightly greenish (-Δa*) and progressively more yellow (+Δb*) in character. The combined effect was a progressive yellowing and browning of the papers after ageing.

Table 2: Colorimetric Values of Paper Samples

Colorimetry	Acid Paper			Copy paper			Filter Paper		
	Control	50%RH	80%RH	Control	50%RH	80%RH	Control	50%RH	80%RH
L	94.44	93.45	92.37	92.92	92.62	92.25	97.16	96.77	96.49
A	-1.13	-1.13	-0.89	2.91	2.18	2.1	-0.37	-0.42	-0.38
B	4.12	6.63	8.12	-10.07	-7.7	-6.23	0.81	2.33	2.8

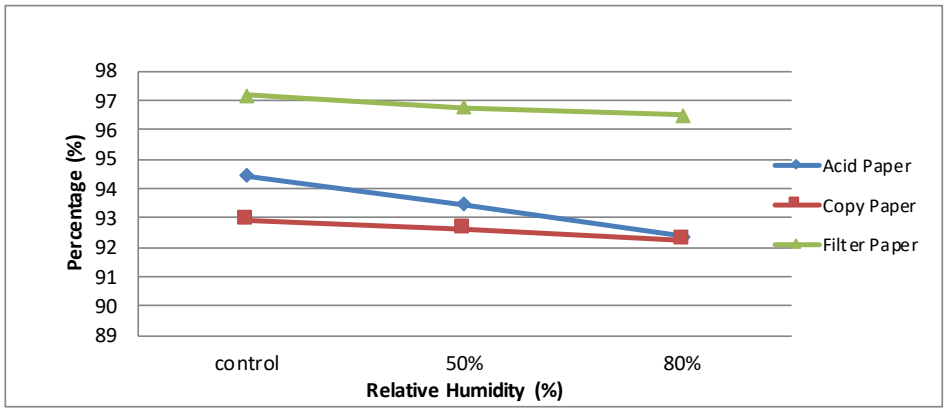

Figure 3: Colourimetry (L*) Values of Paper Sample

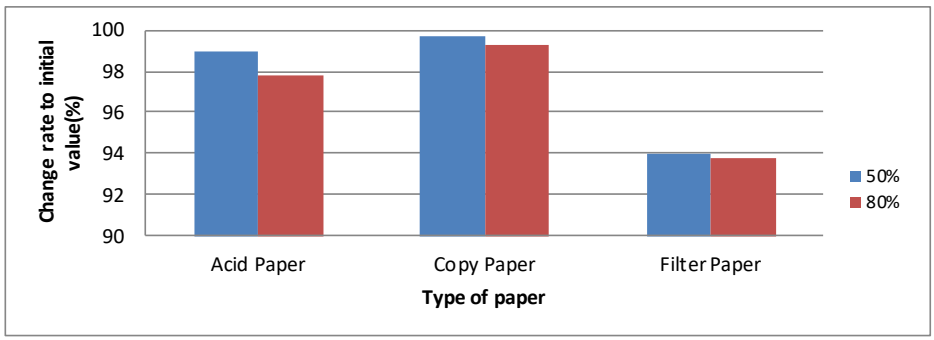

Figure 4: Change of L* Value

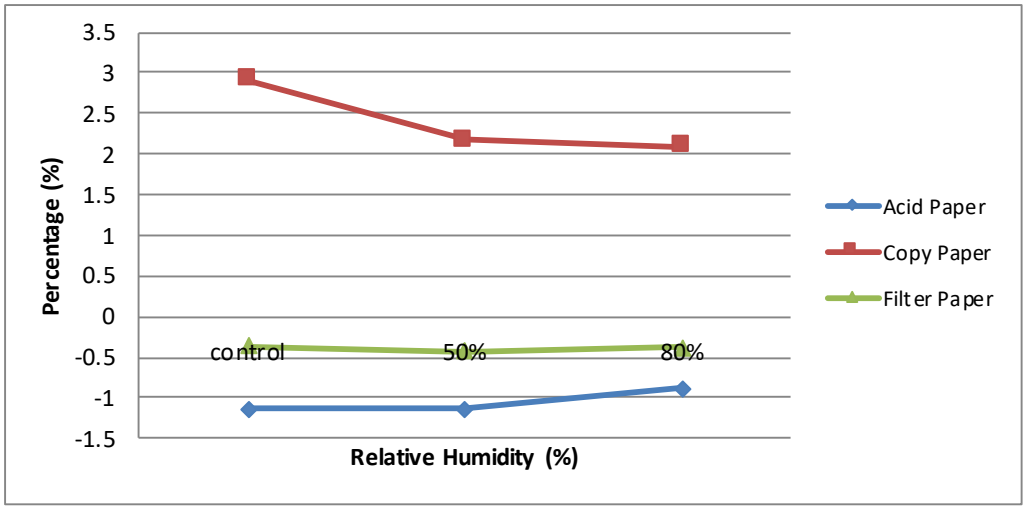

Figure 5: Colourimetry (a*) Values of Paper Samples

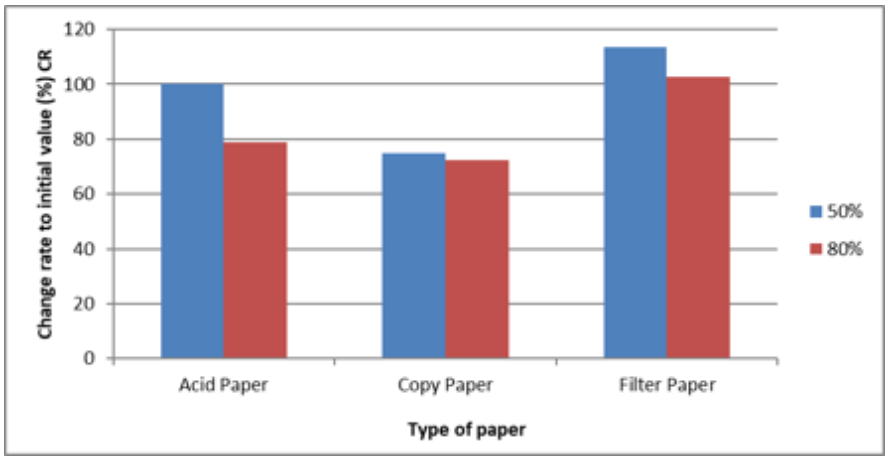

Figure 6: Change of (a*) Values

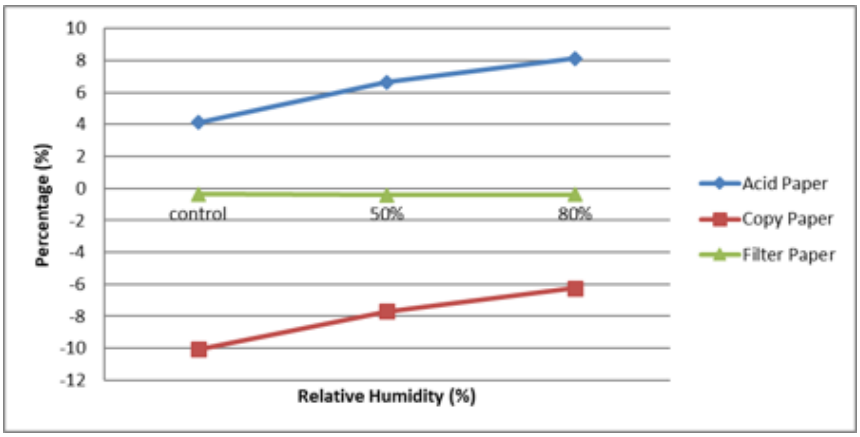

Figure 7: Colourimetry (b*) Values of Paper Samples

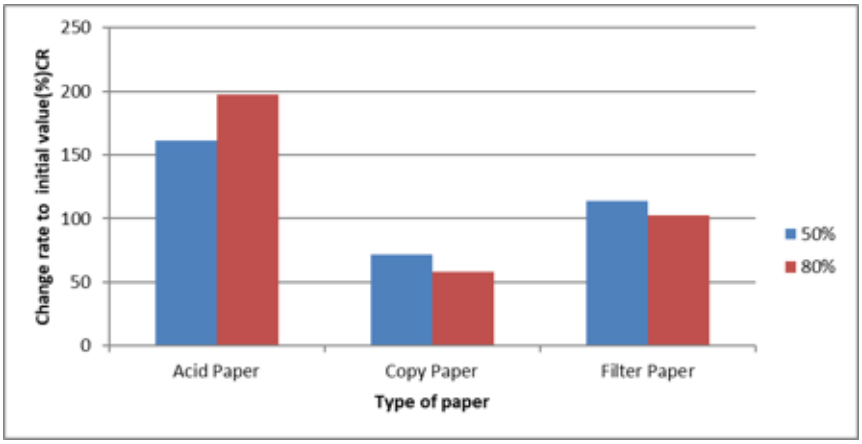

Figure 8: Change of (b*) Values

Conclusion

The rate of the chemical reactions in paper is mainly governed by temperature and relative humidity. Sunlight, dust, and bad air quality further contribute. The paper's composition also plays an important role. Warm conditions provide more enthalpy (energy). It is generally said that the rate of chemical reaction is doubled for each increase of 10 °C in temperature. The results of this study indicate that paper-based documents are first and foremost susceptible to degradation in high RH conditions (80%) in the tropics rather than low RH conditions (50%) and that the degradation rate depends on the quality of the paper. As results indicated, copy paper was more stable than acid paper, the most common paper type found in libraries in Sri Lanka.

Sri Lanka is a tropical country; it has warm and humid environmental conditions throughout the year. When the warm air is cooled in the night, it deposits some of its moisture content, which is absorbed by the paper materials with which it comes into contact. The absence of the dehumidify system in libraries creates a great risk to our heritage made out of paper.

To minimise this effect, especially on hygroscopic papers such as newspapers, they should be deposited in archival boxes made out of chipboard. This board paper serves as a buffer and protects the newspapers. Some libraries have air conditioning facilities as the local authorities believe a low temperature protects the books. It is true that it protects the books at the same time. The AC system causes serious problems for paper documents. Cooling the air by 4°C can raise the RH by as much as 10% (Baljpai, 1999). If the temperature is controlled by reducing it to acceptable levels for books and users alike, the relative humidity must also be controlled to ensure that the books do not absorb the surplus moisture that air extrudes as the temperature falls. It is advisable to use dehumidifiers even if the library is air-conditioned.

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