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The Journals of Law Librarianship, an official Journal of The Tamil Nadu Dr Ambedkar Law University, Chennai, which is published half – yearly. This Journal provides a forum for Library and Information & Law Professionals in general and Law Librarians in particular, for theoretical foundations as well as practical applications, research in the inter- disciplinary areas of Librarianship, Information Management, Knowledge organisations, metric studies, scholarly communications and allied areas of Information science.

In the present Information Society and ICT environment where the generation, access & use of information dominates this Journal provides an opportunity for Library and Information Science Professionals to share their experiences in the management of Library and Information Services.

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- To bring recent trends and developments in the field of Law Librarianship
- To contribute for scholarly communication in the field of Librarianship in general and Law Librarianship in particular.

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Example

Smith, K., & Brown, M. (2012). Author impact factor by weighted citation counts. In G. Martin (Ed.), Bibliometric approach to quality assessment (pp. 101-121). New York: Springer.

Conference paper

Author, A., & Author, B. (Year). Article title. In A. Editor & B. Editor (Eds.), *Conference title* (pp. xx-xx). Publisher location: Publisher Name.

Example

Smith, K., & Brown, M. (2012). Digital curation of scientific data. In G. Martin & L. J. Jones (Eds.), Proceedings of the 12th International Conference on Digital Curation (pp. 41-53). New York: Springer.

Online document

Author, A., & Author, B. (Year). Article title. Retrieved from URL.

Example

Smith, K., & Brown, M. (2010). The future of digital library in Asia. Digital Libraries, 7, 111-119. Retrieved from http://www.diglib.org/publist.htm.

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COMPARING JISTAP TO SIMILAR LIS JOURNALS PUBLISHED IN ASIA: AUTHORSHIP AND TOPICS

Eungi Kim[1]

Dong-Geun Oh[2]

Jisuk Yeo[3]

INTRODUCTION

1. Published by the Korea Institute of Science and Technology Information (KISTI), the *Journal of Information Science Theory and Practice* (*JISTaP*) is a prestigious international journal in information science. *JISTaP*, like many other journals in the field of library and information science (LIS), has a broad scope and publishes articles that reflect a wide range of perspectives and approaches to various areas of information science theory, application, and practice (*JISTaP* Homepage, n.d.). It is helpful to compare *JISTaP* with other LIS journals published in Asia to determine its characteristics.
2. Unlike in Western countries, relatively few LIS journals are published in Asian countries. According to the 2020 SCImago Country and Journal Ranking (SJR) index, only 12 international LIS journals are published in Asian countries. Oh, et al. (2019) pointed out that there is a lack of studies on the topics of research published in non-Western international LIS journals. Identifying commonly published topics in journals comparable to *JISTaP* would be helpful for understanding the characteristics of Asian journals and common research topics in Asian countries.
3. In this study, we analyzed author keywords to investigate commonly researched topic areas. Author keywords have been effectively used in the past to identify unique characteristics of journals (Kim, 2017; Faust, 2018; Li, 2018). We also examined country-focused studies, defined as studies researching subjects within the context of particular countries. Articles that mention country names in the bibliographic entries can be assumed to be country-focused studies. Because authors often focus on particular countries, country names may appear in different bibliographic entries. In this study, we only focused on articles containing country names in the title keywords or author

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keywords because the topics of such articles are likely to be limited to the country names that appear in these bibliographic entries. In the past, country-focused studies have been examined on the basis of citation counts (Abramo et al., 2016; Brunauer & Scherg, 2019). Examining country-focused studies of journals published in Asia may reveal additional characteristics of research topics in this area.

4. There have been several bibliometric analyses of LIS journals published in Asian countries (Brahma & Verma. 2019; Garg et al., 2020; Nath & Jana, 2020; Osunkentan et al., 2021). However, these studies focused on slightly different aspects of bibliometrics, such as productivity, growth patterns, and collaboration patterns. Prieto-Gutierrez and Segado-Boj (2019) conducted a bibliometric analysis of the *Annals of Library and Information Studies* (*ALIS*). They compared the journal to the leading LIS journals in Asia and worldwide (from 2011 to 2017) and found a lower internationalization of *ALIS*. Considering the lack of studies on *JISTaP*, this study aimed to compare JISTaP with other international LIS journals in terms of authorship and topics and provide insight into LIS journals published in Asian countries.

Methods

5. A bibliometric approach was used to conduct this study. From the 12 LIS journals published in Asia, we selected those that had similar characteristics in terms of their scope. The *Pakistan Journal of Information Management and Libraries* was excluded from the sample because this journal was not covered in 2020. *Library and Information Science* and *the Journal of Library and Information Studies* were also excluded because of the relatively small number of articles published. The journals finally selected for the comparison were the *Malaysian Journal of Library and Information Science* (*MJLIS*), *DESIDOC Journal of Library and Information Technology* (*DJLIT*), *ALIS*, and *JISTaP*.
6. The details of the selected journals can be found in Table 1. The research data on *JISTaP* was obtained from the *JISTaP* website. Because Scopus coverage of *JISTaP* only began in 2017, not all bibliographic records were available from Scopus. Therefore, these records were manually collected from published articles available on the *JISTaP* website (http://www.*JISTaP*.org). The other three journals compared were indexed before 2017. Thus, bibliographic records for these journals were obtained from Scopus for the period from 2013 to August 2021. For comparison, Asian LIS journals that published a comparable number of documents between 2013 and August 2021 were downloaded from Scopus.
7. The Scopus coverage years of the studied journals were very short. Except for *MJLIS*, Scopus has only begun to include these journals in the last decade. *MJLIS* is indexed in both the Web of Science SSCI Index and Scopus, whereas the other journals are indexed only by Scopus. *MJLIS* has the most years of extended coverage and the highest h-index (24). *JISTaP* ranks 4th in terms of h-index. However, the h-index is contingent on the age of the journal because it takes into account both citations and published documents.

Table 1. *JISTaP* and Other Similar LIS Journals Published in Asia

Rank (H Index)	Title	SJR Quartile	H index	Total Docs. (2020)	Country	Coverage
1	*Malaysian Journal of Library and Information Science* (*MJLIS*)	Q2	24	20	Malaysia	1996-2020
2	*DESIDOC Journal of Library and Information Technology* (*DJLIT*)	Q1	13	53	India	2012-2020
3	*Annals of Library and Information Studies* (*ALIS*)	Q2	13	27	India	2011-2020
4	*Journal of Information Science Theory and Practice* (*JISTaP*)	Q3	5	24	South Korea	2017-2020

Country of Authorship

8. We first examined the countries of the authors who contributed to the Asian LIS journals. Table 2 shows the frequency counts of the first authors' country names. Only the first authors were considered because the countries of the coauthors were missing or difficult to determine from the authorship information. In *JISTaP*, authors from South Korea contributed the most (20.8%), and authors from India contributed the second most (18.0%). Authors from Malaysia contributed the most to *MJLIS* (38.8%), and authors from India contributed the most to *DJLIT* (82.0%) and *ALIS* (76.8). Unlike authors from most other countries, authors from South Korea contributed mainly to *JISTaP*, and their contributions to other journals did not make the top 10 lists. In contrast, authors from India contributed significantly to all the journals. To a lesser extent, authors from Nigeria also contributed to all the LIS Asian journals listed in this table.

Table 2. Frequency Count of the First Authors' Countries

Rank	*JISTaP*		*MJLIS*		*DJLIT*		*ALIS*	
	Country	**%**	**Country**	**%**	**Country**	**%**	**Country**	**%**
1	South Korea	20.8%	Malaysia	38.8%	India	82.0%	India	76.8%
2	India	18.0%	India	12.0%	Nigeria	2.6%	Nigeria	6.0%
3	U.S.	11.2%	China	8.0%	Iran	1.8%	Sri Lanka	4.1%
4	Germany	6.7%	Iran	5.3%	Indonesia	1.8%	Iran	2.2%
5	Nigeria	6.2%	Taiwan	4.7%	U.S.	1.6%	Bang ladesh	1.5%
6	Singapore	3.9%	Pakistan	3.8%	Fiji	1.0%	South Africa	1.1%
7	Bang ladesh	3.9%	Bang ladesh	2.9%	Spain	0.8%	U.S.	0.7%
8	Iran	3.4%	Singa pore	2.4%	Saudi Arabia	0.8%	Tanzania	0.7%
9	Thailand	2.8%	Nigeria	2.4%	South Africa	0.6%	Poland	0.7%
10	Malaysia	2.8%	Kuwait	2.2%	Malaysia	0.6%	Japan	0.7%

Common Topics of Papers Published in *JISTaP* and Similar Journals

9. The top 10 author keywords for these journals are listed in Table 3. As shown, bibliometrics and scientometrics were the most frequently researched topics in total. Each journal has its own set of keywords in this table, which reflect prominent topics that were frequently discussed in each journal. The keywords unique to *JISTaP* are "social media", "topic modeling", and "information needs". The keyword "academic libraries" was frequently mentioned in *MJLIS* (ranked 3rd) and in *DJLIT* (ranked 6th). Keywords unique to ALIS include "Sri Lana", "Sentiment Analysis", "Open Access ", and "KOHA". Keywords such as "India"', "Sri Lanka", and "Malaysia" indicate that authors published country-focused articles in all Asian LIS journals.
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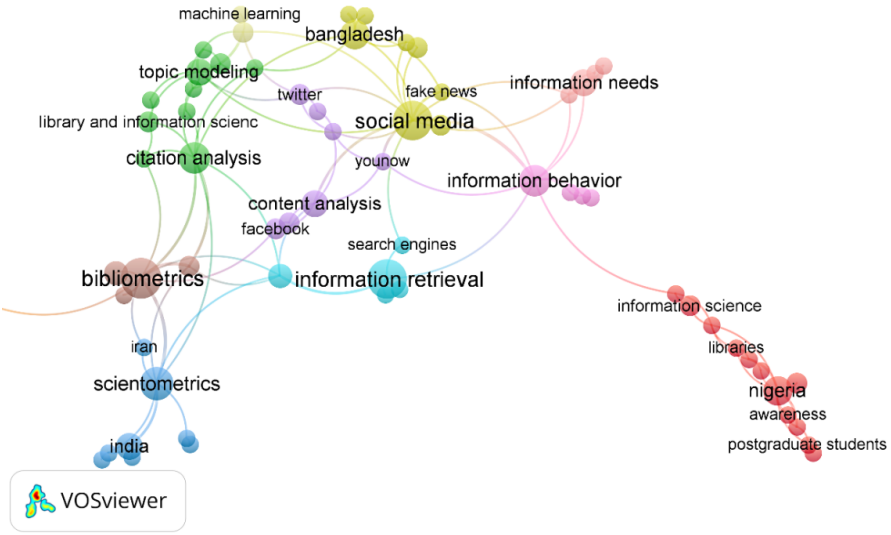
Table 3. Top 10 Author Keywords in the Asian LIS Journals

Rank	*JI STaP*	*MJLIS*	*DJLIT*	*ALIS*
1	Bibliometrics	Bibliometrics	India	Bibliometrics
2	Social Media	Malaysia	Bibliometrics	Scientometrics
3	Information Retrieval	Academic Libraries	Scientometrics	India
4	Scientometrics	Citation Analysis	E-Resources	Library Services
5	Information Behavior	Scientometrics	Citation Analysis	Sri Lanka
6	Nigeria	Publication Productivity	Academic Libraries	Sentiment Analysis
7	Citation Analysis	Information Literacy	Research Productivity	Open Access
8	Bangladesh	Scholarly Communication	Library Services	KOHA
9	Topic Modeling	Research Productivity	University Libraries	Information Literacy
10	Information Needs	India	Information Retrieval	Citation Analysis

Note: Keywords that are unique to the journal are shaded.

14. Author keywords were visualized using VOSViewer to represent the topics published in the LIS journals. Figure 1 shows a visualization of keywords of *JISTaP* that occurred two or more times. The three dominant research areas were a) information retrieval, b) bibliometrics, and c) social media. The visualization of keywords of the other three keywords are shown in the appendix, and the topics of the other journals match the keywords identified in Table 3. The charts of the journals' keywords in the appendix show a larger number of keywords because all of these journals consisted of a considerably larger number of keywords than *JISTaP*.

Figure 1. Visualization of Keywords of *JISTaP*



Note. The figure displays keywords with occurrences of ≥2.

Country Focus Studies

15. Table 4 shows the percentage of country-focused studies by country name. In *JISTaP*, South Korea is the most frequently mentioned country (7.3%), whereas India is the second most frequently mentioned country (6.2%). In comparison, more country-focused papers were published in *DJLIT* (18.8%) and *ALIS* (17.6%), with India being the most frequently mentioned country in these journals. Overall, the most frequently mentioned country name in each journal is that of the country in which the journal is published. In addition, authors from Asian countries contribute the most to these journals. Authors from India and Nigeria contributed to all of these journals, focusing on their country as the research topic.

Table 4. Top 10 Frequently Mentioned Country Names in the Title or Author Keywords

Rank	JISTaP		MJLIS		DJLIT		ALIS	
	%	Country	%	Country	%	Country	%	Country
1	7.3%	South Korea	14.0%	Malaysia	18.8%	India	17.6%	India
2	6.2%	India	4.0%	India	2.4%	Nigeria	5.2%	Nigeria
3	5.1%	Nigeria	2.0%	Pakistan	1.0%	Bangladesh	3.0%	Sri Lanka
4	3.9%	Bangladesh	2.0%	Bangladesh	0.6%	Fiji	1.9%	Bangladesh

Rank	JISTaP		MJLIS		DJLIT		ALIS	
	%	Country	%	Country	%	Country	%	Country
5	2.2%	United States	1.8%	Nigeria	0.4%	United States	0.7%	Iran
6	1.1%	Singapore	1.8%	Iran	0.2%	Zambia	0.7%	China
7	1.1%	Iran	1.3%	Taiwan	0.2%	Thailand	0.4%	Turkey
8	0.6%	Vietnam	1.3%	Sri Lanka	0.2%	Sudan	0.4%	Tanzania
9	0.6%	Turkey	1.3%	Singapore	0.2%	Sri Lanka	0.4%	Japan
10	0.6%	Thailand	1.1%	China	0.2%	Spain	0.4%	Indonesia

Discussion and Conclusions

16 In this study, we compared JISTaP with similar international LIS journals published in Asian countries. Each journal that we examined showed some distinctive characteristics in terms of authors' countries. Journals published in India, namely DJLIT and ALIS, are older than JISTaP. However, these journals mostly published articles written by authors from India. Except for MJLIS, all the journals examined were listed only in Scopus. It is also possible that authors may consider publishing in Asian journals indexed by the Web of Science less difficult than publishing in other regions of the world. Nonetheless, the results showed that the Asian LIS journals relied on contributions of authors from Asian countries, particularly those countries where the journal is published. At the same time, a considerable proportion of authors tend to submit their articles to international journals published in their own countries or regions.

17. The result also showed that each journal has a distinctive scope, and the characteristics of journals slightly differ in terms of topical areas of research. Topics about social media were the most common in JISTaP, consistent with the research conducted by Li et al. (2019). They pointed out that social media has become one of the important research areas in recent years. However, other journals did not have social media as one of the top 10 most frequently researched topics but had library-related issues as common research subjects. Additionally, many researchers published country-focused studies in the Asian LIS journals. Understandably, the most frequently mentioned countries in these country-focused papers were identical to the countries where the journals are published.

18.

19. These results suggest that contributions from more diverse countries are needed in all the Asian LIS journals. Publishing international LIS journals would be conducive to promoting the scholarly

knowledge of a country. Most authors seem to prefer to publish their articles in international journals where the journal's country is the same as the author's affiliated country. However, relying on local contributions may hinder the development of the journal because authors from other countries may become reluctant to submit their articles for publication. The finding of this study supports the view of Prieto-Gutierrez and Segado-Boj (2019) regarding the need for more internationalization among Asian LIS journals. Soliciting authors from other countries to submit articles for publication may be needed to expand the pool of authors. Such efforts should help promote Asian LIS journals to the rest of the world.

ACKNOWLEDGEMENT

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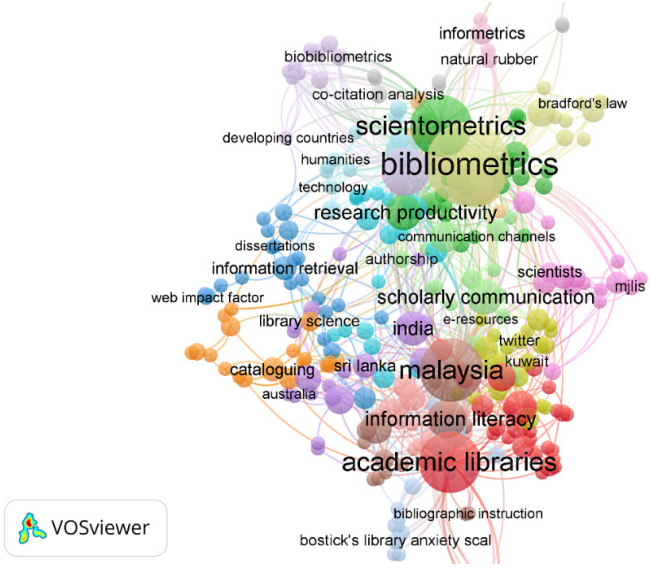
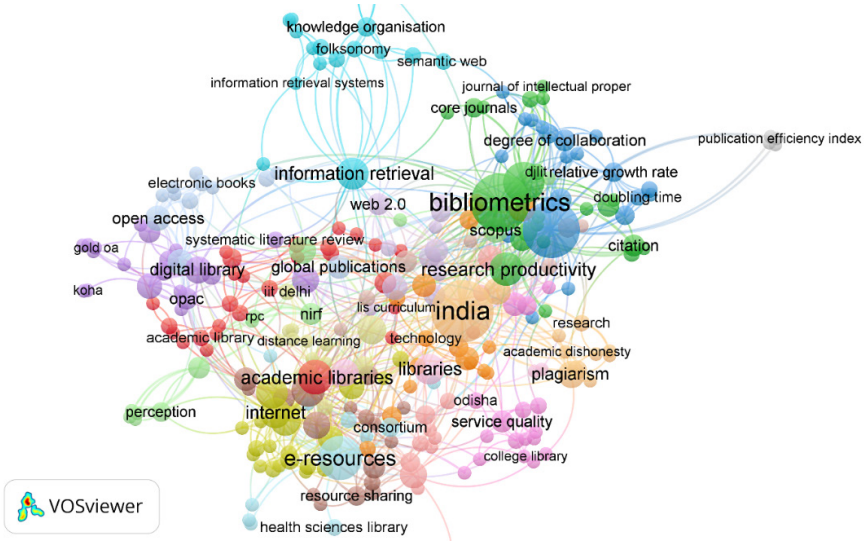
APPENDIX. VISUALIZATION OF KEYWORDS OF THE SIMILAR JOURNALS

Figure 2. Visualization of Keywords of *MJLIS*



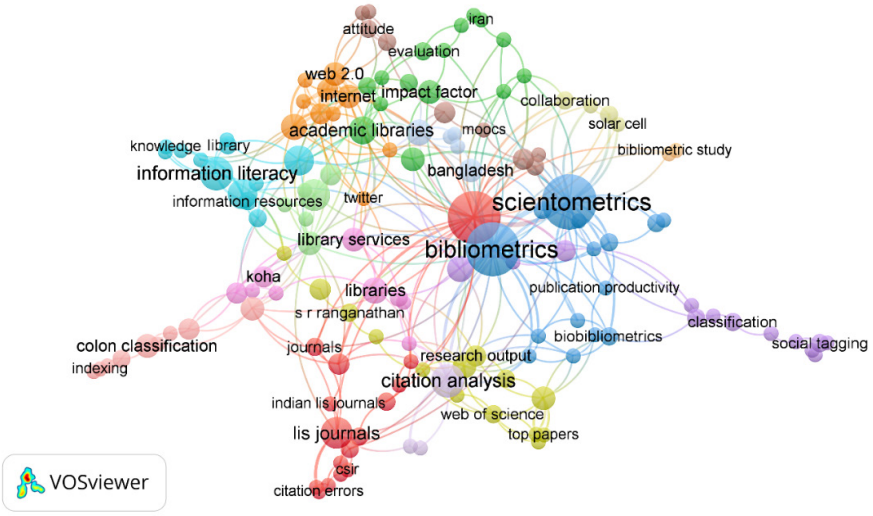
Note. The figure displays keywords with occurrences of ≥2.

Figure 3. Visualization of Keywords of *DJLIT*



Note. The figure displays keywords with occurrences of ≥2.

Figure 4. Visualization of Keywords of *ALIS*



Note. The figure displays keywords with occurrences of ≥2.

MANAGING DISTANCE LEARNING IN INFORMATION SCIENCE DURING THE COVID -19 PANDEMIC: A CASE OF SUKHOTHAI THAMMATHIRAT OPEN UNIVERSITY, THAILAND

Chutima Sacchanand[4]

Abstract

COVID 19 crisis has called for a transformation of the entire higher education landscape and a sudden shift from face to face and traditional distance learning toemergency entire online teaching and learning. This created new insight into distance learning. This paper provides an overview of challenges ofdistance learning in higher education in Thailand during the COVID 19 pandemic, online learning situations in the Thai highereducation, situation of distance learning in information science at STOU andthe experiencesof Sukhothai Thammathirat OpenUniversity(STOU)inmanaging challenges and leading the new normal of distance learning in information science.

Keywords: Distance learning , Online learning, Sukhothai Thammathirat Open University (STOU), Information science program, COVID 19

INTRODUCTION

Covid-19 as a global threat to humanity has forced social distancing, physical closure of educational institutions and global shutdown of educational activities.Higher education institutionsneed to sudden shift from face to face teaching and learning and traditional distance learning to entire online learning courses and programs whereby teaching and learning is undertaken remotely on digital platform and in an online environment. Emergency online teaching (EOT) offered in response to a crisis such as COVID-19 is not the same as well-planned online learning experiences (Hodges, Moore, Lockee, Trust, & Bond, 2020 ; Lorenza & Carter, 2021, p.1). COVID 19 crisis serves as a wake up call for a transformation of the entire higher education landscape and createsnew insight in distance learning during the pandemic and the new normal .

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Challenges of distance learning in higher education in Thailand during the COVID 19 pandemic

Distance learning or distance education has a relatively long historythat spans almost two centuries(Spector, Merrill, Merrienboer& Driscoll,2008). Its growth has been aided by social, economic and technological advances that have re-positioned its role within higher education from the periphery to center stage. (Courtney & Wilhoite-Mathews, 2015,p.262). Distance learning which was long established in many countries including Thailand, has been recognized throughout the world as an accepted modality for providing lifelong education, a viable alternative to campus-based education , and an independent and interactive educational access at all levels. It used a wide range of technologies to deliver courses and educational services to distance learners.

TheCOVID 19 pandemic has challenged the education system across the world and forced educators to shift to an emergency online mode of teaching and learning. Many higher institutions and teaching faculty that were earlier reluctant to change their traditional pedagogical approach had to shift to entireonline teaching. The traditional distance learning was forced to move from correspondence or print based distance learning and blended learning to entire online learning. It is well recognized that online learning is no more a supplement or an option but a necessity, a promise, a bone and a new normal. In Thailand, even though all open universities that offer distance learning programs as well asmost higher education institutions especially universities under the Ministry of Higher Education, Science, Research and Innovation have already experienced online learning, the degree of readiness for the rapid transition to an entire online environment was unequal across all higher institutions in the country and they varied greatly from one university to another according to the affiliated ministries, type and size of the universities.As mentioned by Lorenza & Carter (2021), emergency online teaching (EOT) due to COVID19 is different to well-planned online learning.The unplanned, rapid and uncertain durationof what happened presented challenges to higher institutions worldwide to overcome with this transition.Some major challenges in managing the distance learning in the online environment during this crisis can be summarized as following:

Students: The transition from classroom learning to online classes has left many students behind especially those with socio-economic problems. Some students without devices and reliable internet access and technologyat home struggle to participatein digital learning. Some other students' difficulties include lack ofmotivation to learn, lack of encouragement and engagement , isolation, emotional, mental and physical health, increased academic workload, as well as inadequate digital literacy skill and learning skills to engage with quality online learning experience.

Graduates: The lack of internships in the real situation may cause the lack of neededcompetencies and the risk of job lost in a constrained labor market due to the poorly performing economy that has been aggravated by the pandemic.

Faculty / academicians: Resistance, academic workload, substantial burden of work, no incentives, limited expertise with online technologies and online teaching and learning are some faculty problems that have been found.

Technology and connectivity **:** IT infrastructure, internet access and connectivity, reliable hardware and software,digital divide, as well as delivery mode of online learning and technical and quality issues are important issues to be considered.

Student support services: Online higher education continues to grow, yet its high dropout rates remain a pressing and complex problem. Risk factors, the most important ones were course and program factors (student support), student factors (motivation, time management skills, and satisfaction), and environmental factors (time- and financial-related issues) (Xavier & Meneses, 2020, p.3). In this regard, students support services as well as online library resources and services that can be accessed through the university platform to support online learningare crucial to help students cope with the risk factors and manage their studies successfully.

Online learning situations in Thai higher education

Onlinelearning or e-learning is not a new phenomenon in Thai higher education. It has been widely used in Thai universities both the traditional and open universities for more than twenty years . The online or e-learning situation of the universities in Thailand as found in research conducted by Boondao, Komlayut &Poonnawat (2004) showed that the traditional and open universities had similarities and differences regarding of e-learning courses. Both used online learning as a supplement to existing courses, and used synchronous and asynchronous interaction and offline techniques for the interaction between lecturers and students. Most students were satisfied with the online courses.

A survey of situation and trends conducted by Rueangprathum, A.; Philuek, W. & Fung, C.C. (2008) showed that the development of e-Learning systems in Thailand are supported by the Thai government under the National ICT Plan and Education Policy. It builds upon the existing strengths and addresses existing weaknesses of domestic ICT with an objective to encourage online learning among the academic organizations. In terms of ICT readiness based on e-readiness, network readiness, technology infrastructure readiness, and e-learning readiness, Thailand is ranked in the moderate level. Thailand is also ready to use ICT to develop e-Learning for enhancing teaching and learning skills in order to improve the quality of the current status of education in the country. Moreover, the information from various surveys has shown that many e-Learning sites are implemented by universities and academic organizations. On the technical aspect, free open source software is more popular especially Moodle. The trend of Thai online system is growing and it is expected that the continual development will benefit for all in the long term.

There has been a rapid growth of online learning and in the number of online courses in Thai universities. The advantages of online education (i.e., greater access, increased flexibility, and decreased costs) have rapidly impacted higher education policies and practices. The main driving forces in the implementation of the online learning in Thai higher education were thepolicies of the Higher Education Commission, Ministry of Higher Education, Science, Research and Innovation.(formerly affiliated with the Ministry of Education). The Higher Education Commission has laid a stable foundation for online learning in higher education in Thailand for more than 20 years ago. Some of these include: *Inter-University Network : UniNet* found in 1996 aiming at managing and sharing ICT to support the teaching and learning and research ;*Thailand Cyber Universityor TCU*found in 2005 as one strategy for responding to the educational reform

and extend educational opportunities by cooperating with all existing universities for providing online distance education in quality ways (Sombuntham &Theeraroungchaisri, 2006, p. 155), and *Thai MOOC*, a Massive Open Online Course with a focus on life-long education lessons; and *Thailand Library Integrated System: ThaiLIS* (e.g. Thai digital collection database) found in 2009to provide access to electronic format of dissertations, theses, journal articles and rare books from ThaiLIS members.

Others are *Guidelines for degrees program offered through distance education system*issued by the Ministry of Education in 2005 which called for an increasing interest in online learning and more strong commitment and support from the administrators at the policy level both traditional and distance universities as online was seen as important technology to improve the quality of teaching and learning and enhance the image and academic profile of the institutions; and the *Digital Competencies for Undergraduate Degree* issued in 2018 as part of the National Qualifications Framework (TQF) for Higher Education in Thailand.

COVID-19 is thus an opportunity for higher education institutions to develop online education further, to embrace online learning , not as an alternative but as multiple delivery modes to expand access and strengthen excellence in teaching and learning, to create new learning environment and increase opportunities for learning. The pandemic can serve as a springboard for re-thinking and reimaging the future of higher education and distance learning patterns of flexibility for the individual learners to response to the challenges faced by COVID 19.

Situation of distance learning in information science at STOU

Sukhothai Thammathirat Open University (STOU) is the eleventh public university established in 1978. It is the first true distance teaching university in Thailand and in Southeast Asia. STOU distance learning system expanded the role of higher education in Thailand by engaging learners who previously had no opportunity to further their education. Since its establishment, STOU has enabled the development of individuals and communities throughout Thailand and beyond. STOU has received many national and international awards and recognitions for its accomplishments**.**

STOU distance education system took its earliest the form of correspondence teaching. Instruction was given through instructional media which are mainly print-based material, programmed textbooks and workbooks. Other support media include educational radio and television programs, cassette tapes, videotapes, computer-assisted instruction (CAI), and face-to-face tutoring.STOU implemented new media and online learningsince 1985. The variety of educational media made STOU's distance education programs accessible to students not only in the Thailand but also students abroad.In 2021 during the pandemic, STOU launched the application "STOU SISA app" (Student Info Service Application) to provide information about teaching and learning, examination and other useful and reliable information available for IOS and Android. STOU distant students can access and check the information conveniently and quickly by themselves through the application.(STOU,2021). STOU distance learning system has made quality higher education accessible to all. STOU, through its School of Liberal Arts, has offered the information science programs using distance education system at the bachelor, master and doctoral levels using distance education system since the year 1989,2002 and 2010 respectively.Distance learning in library and information science has made a major

contribution to Thai librarianship and library and information science education in Thailand and in the Asia-Pacific region. STOU through the Information Science Programs of the School of Liberal Arts met the COVID 19 challenges of distance learning , with the management strategies and movement to lead the new normal .

The situation of online learning in library and information science in ASEAN countries before the COVID 19 pandemic, as reviewed by Sacchanand (2014) showed that library and information schools in the ASEAN countries are keeping up with changes through the influence of the information and communication technologies. Online learning has been increasingly used widely in library and information schools in ASEAN countries in both the traditional and distance institutions. Online learning has been seen as important technology, to improve the quality of teaching and learning in a technology-driven system of teaching and learning, and to enhance the image and academic profile of the profession, institutions, countries and regions. The rapid growth in the number of LIS online learning programs/ courses worldwide present significant challenges to LIS educators in ASEAN countries. Online learning presents immense opportunities for the promotion of an effective educational environment in the digital age and calls for new competencies and strong motivation of faculty and learners that best suit to the nature of library and information science particularly to the ASEAN context through collaborative effort among ASEAN LIS educators, professionals and institutions as well as strong support at the national and regional level.

This laid the opportunities for STOU and the information science programs to adopt the management strategies for further development of the online learning environment, and close the gaps intechnology infrastructure , inadequate accessibility to library and information resources , digital divide, resistance, lack of motivation to learn, or digital literacy skills and othersto cope with challenges during the COVID 19 pandemic. As crisisalways bring challenges andgreat opportunities, from now on, online learning will be the norm and a major tool for STOU and the information science programsin leading the new normal and moving towards online university .The impact the COVID crisis undoubtedly force us to rethink and redesign the management of quality distance learning in the online environment.

Managing challenges and leading the new normal of STOU distance learning in information science

STOU manages challenges of distance learning in information science using the key strategies focusing on policy, digital infrastructure and connectivity and faculty and staff development leading towards the new normal through learner-centered online learning, online examination, online experientialand professional training experienceas following:

Management strategies

Policy

Timely and effective policy responses are necessary to deal with the economic andsocial impact of the COVID-19 pandemic. (OCED,2020,p.97).Research findings conducted by Boondao , Komlayut & Punnakan (2009) showed that one key factor for the successful online learning is clear university policyand planning with strong

and continuous support from the administrators. The essential guidelines for the university's development and implementation should also be formed.STOU formulated many policies and guidelines related to the online teaching and learning for administrators, teaching faculty and the teamsin the management of online learning programs and courses. STOU teaching and learning model has been more fosteredtobe a collaborative partnership between teaching faculty and instructional designers, educational technologists , online developers , educational measurement specialist , librarians as well as invited key persons outside the university both in Thailand and abroad. Collaborative partnership or networking has been an integral part of the success of STOU since its founding.

Digital infrastructure and connectivity

STOU has invested in efficientIT infrastructure, networks, applications , new tools , new technologies and new media in order to support or compliment the management of the online learning programs and a range of related activities especially the production ofSTOU instructional mediawhich are digital media, and the online examinationwhich has been first takenin the year 2020 during the COVID 19 pandemic , to enable the university to respond to these challenges.The online learning has raised greater demand for fast and reliable digital connectivity, the readiness of digital infrastructure, digital connectivity as well as digital learning materials for educational continuity in times of crisis COVID-19.

Faculty and staff development

It has been well recognized that although the technology of distance learning gets most of the attention, it is really teaching strategies and style which have the most impact on the quality of learning in distance programs. (Kimball,2002). Improving quality in online teaching and learning requires that both teaching and non-teaching staff are equipped with knowledge and competencies needed to support online students for online teaching and learning. In terms of STOU faculty, especially the information science teaching faculty , they are familiar and well trained with online technologies, online teaching and learning techniques and the management of online courses and online classes as the usual practice. This is different from traditional universities where there are problems of resistance to online teaching and learning and limited expertise with online teaching and technologies. Anyway, as teaching faculty in information science, STOU information science faculty need to continuously update their knowledge and competencies to keep current with the fast changing technologies and the technology –oriented information science discipline. Faculty and staff development is one STOU key strategy in the crisis management. STOUorganized ongoing intensive online training, workshop and seminars on new technologies, online teaching and learning techniques and related issues.

Leading the New Normal

The COVID 19 pandemic has brought important lessons and opportunities to manage challenges and lead the new normal of distance learning in information science. Key activities include the learner-centered online learning, online examination, and online experiential and professional experience

Learner-centered online learning

Before the COVID 19 situation, STOU information science programs used blended learning. Online learning was mainly used for graduate students , as a supplement to existing courses, with the synchronous and asynchronous interaction and offline techniques for the interaction between lecturers and students. Due to the social distancing measures, all face to face learning activities , e.g. tutorial sessions, practical workshops

, intensive seminars and professional experience training have been moved to learner-centered online learning. Today's distance students can lively communicate, chat and interact with faculty and fellow course-mates in the online classrooms using online communication techniques. They can download a wide range of reading materials and other resources in addition to print textbooks. This is a flexibly customized and promising mode of delivery that geared more towards learner-centeredorientation. Students' acceptance , readiness and engagement of online learning should bemore encouraged as they are more likely to succeed when they feel connected to a supportive and friendly online learning environment. Covid-19 challenges also need online learning to bridge the digital divide and improving students' learning and professional experiences as well as twenty first century skills and online ethics and etiquette and professional behaviour to meet the needs of the learners and the global community.

Online examination

Online examination is a big first step for STOU's transformation to be an online university. STOU examination was usually administered in every province around the country for the convenience of students who scattered around the country. Due to the pandemic, STOU has moved to online examination operated with Moodle and WebEx since July 2000 during the COVID situation. Students can use a PC computer, notebook computer, tablet, or smartphone at their convenience. The system requires the internet speed at 4 Mbps (Megabyte) for computers and at least 3G (Gigabyte) for mobile devices. Students' identity verification and proctoring was done through live video and audio monitoring. (STOU, 2020).

The shift to online examination provides an opportunity to reconsider STOU evaluation system which at undergraduate levels usually consists of semester examinations and reexaminations , assigned work (optional), experiential training and practicum (if any) . For master's and doctoral degree consist of course works , assigned works, semester examinations, thesis examination for Plan A or comprehensive and independent study examinations for Plan B as well as graduate professional experience. Students' evaluation is important not only to improve students' learning outcomes in higher education but also to maintain educational standards and strengthen the credibility of the Information Science programs and the university degrees. As evaluation is important driver of learning , further discussion should be made in the design of different assessment formats of examination and evaluationto measure students' knowledge and competencies, and ability to apply their knowledge and solve problems in the real situation.

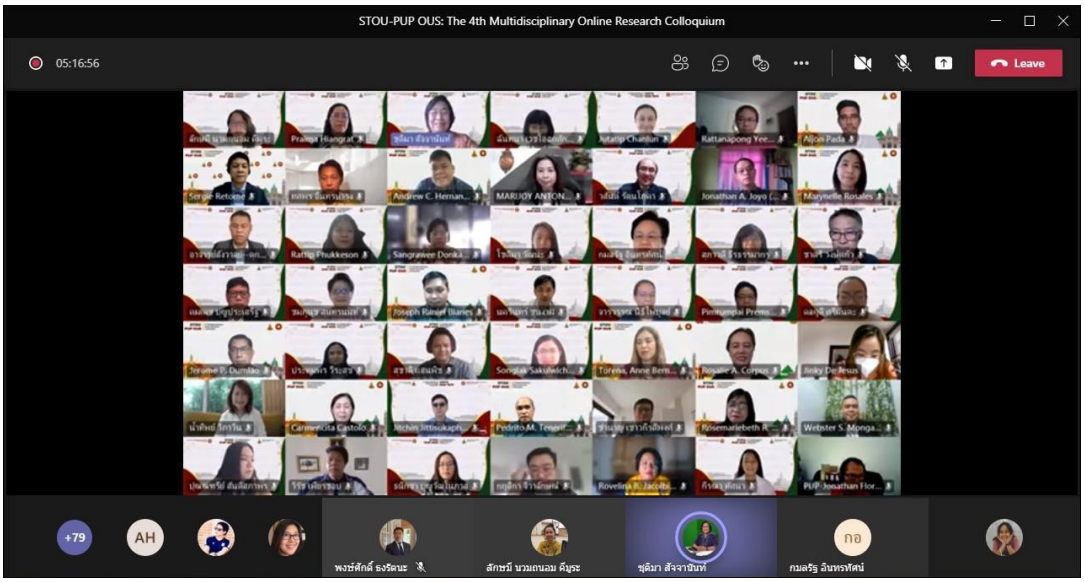

Figure 1 STOU - PUPOUS Joint Online Multidisciplinary Research Colloquium

Online experiential and professional experience

Experiential and professional experiences at STOU require a face-to-face meeting. All these sessions move to online. The Information Science programs come up with alternative projects, or programs that can meet the minimum standards. Home- or offsite-based reports / projects overseen by faculty and/or academic advisors, and similar types of learning experiences that are closely tied to student's academic programs. One collaborative project of great interest is STOU - PUPOUS Joint Multidisciplinary Research Colloquium, a collaborative project between the Ph.D. information Science program , STOU and the Polytechnic University of the Philippines , Open University System (PUP OUS) which has been jointly organized consecutively under the MOU between the two institutionssince 2018. The face to face colloquium has been moved to successful online colloquium since 2020.This colloquium strengthen the good network and partnership between STOU and PUP OUS.The activities have successfully created a research atmosphere in open learning and distance learning. The assessment showed that the participants were very satisfied with all the sessions carried out. (STOU,2021)

SUMMARY

The COVID-19 pandemic has resulted in dramatic changes in the global educational landscape, both face to face and distance learning, with the distinctive rise of distance learning on digital platforms or online learning. The online learning has been implemented in every field and challenged educators in the field of library and information science worldwide.The lockdown has less impact on STOU information science graduate programwhere online learning are used on a regular basis.In addition, STOU continuously adapted to the technological change and developed its STOU distance learning system and STOU Plan. The impact of the Covid-19 pandemic disruption on distance learning, STOU and the Information Science program is going on . Faculty, academicians , educators and professionals in the field need to quickly adapt and better prepare to reimagine and refocus the presence ofdistance learning and the information science education, profession and professionals in the new normal .

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THE ROLES OF LIBRARIES: SUPPORTING SUSTAINABLE DEVELOPMENT AND CLOSING SMART DIVIDE

Seungmin Lee[5]

Abstract

The pandemic of COVID-19 raises many social, educational, and informational problems, which should be addressed to achieve sustainable development of the entire society. The role of libraries has become more important than ever in the current society and in the New Normal era. Thus, library communities should play a new role in understanding and adapting to the social needs to support the sustainable development of society as well as close the evolving digital divide and smart divide. This research considered the roles of library community from two important aspects: supporting sustainable development and closing the smart divide. As a result, this research proposed the roles of library to address the current problems: supporting information activities as a core of sustainable development, supporting educational activities, and closing the smart divide through library. Additionally, in order for library to fully function as a social, educational, and information institution, librarians should be the core of library and library community.

Keywords: Library community, Sustainable development, Smart divide, Digital divide

INTRODUCTION

The aftermath of COVID-19 will not disappear completely. It has brought that non-face-to-face and online services have already permeated our daily lives. After the COVID-19 crisis, the concept of 'New Normal' has been used as a core word symbolizing the current society. The phenomena and standards that previously seemed abnormal are gradually becoming very common.

Currently, the harms caused by COVID-19 have been discussed so much and many research insist how we should lead our lives in the era of new normal after COVID-19. Due to the epidemic of COVID-19, the entire society is undergoing many transformations and we are now facing many social problems caused by COVID-19. Although many people may recognize those problems from various perspectives, there are some issues that we are overlooking: the evolution of digital divide caused by the pandemic situation and sustainable development.

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The digital divide is a social phenomenon generally due to the evolution of information technology. Many countries have made efforts over a long period of time to close the digital divide as a social problem. Different from the traditional phenomenon of digital divide, however, the digital divide in the pandemic situation caused by COVID-19 is more serious and is developing in a different way from the traditional digital divide, including educational divide, economic divide, and social divide.

Many countries are already aware of the seriousness of the educational divide resulted from the interruption of information activities, social distancing, and non-face-to-face communication in the COVID-19 era. Although many approaches and strategies have been proposed to solve these problems and bridge the gaps resulted from the digital divide, most of them, including applying a new infrastructure, dissemination of digital devices, and education to enhance digital literacy, have not been much effective yet.

One of the approaches to solve these problems is to use libraries and library communities as social and informational infrastructure because libraries have been playing an important role in closing the digital divide for a long time. In order to fully function as an institution for resolving the problems of the digital divide and close the social and educational gap in the current situation, it is necessary to come up with a plan and direction to secure the sustainable development of library communities and to bridge the social and educational divide. From this perspective, this research aims to discuss the roles of library community to cope with the two important but not widely recognized issues: supporting sustainable development and closing the evolving digital divides in the new normal era.

2. SUSTAINABLE DEVELOPMENT AND LIBRARY COMMUNITY

2.1 Implication of Sustainable Development

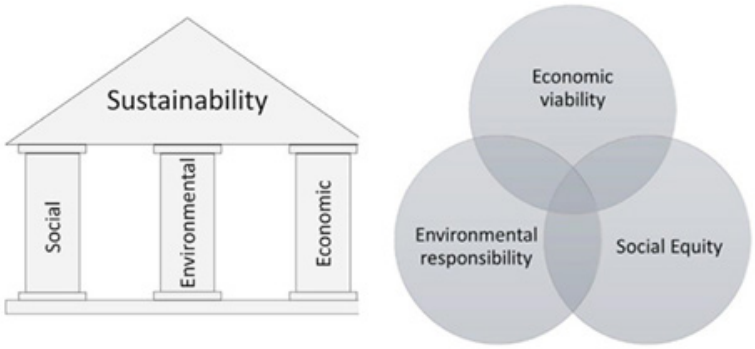
Currently, sustainable development is being discussed focusing on environmental aspects such as sustainable materials, recycling, and reuse. However, what these concepts mean and how they should be reflected in our society are often mentioned in somewhat ambiguous ways. Although the importance of the roles that library communities should play to support sustainable development is growing, the direction or guidelines are not clearly discussed. Thus, in order to fully function to support sustainable development, the concept and scope of sustainable development should be analyzed first.

The concept of *sustainability* is generally defined in many ways. The word *sustainable* is not a new term, and has paid a lot of attention over the past few decades. It is established as a concept that directly or indirectly affects the lives of modern people. The term *sustainable development* was coined in 1987 in the Brundland Report of the United Nations World Commission on Environment and Development, named as *Our Common Future*. In addition to environmental aspects, this report deals with sustainable development from a social, economic and cultural perspective.

Since then, many researchers have continued to discuss the concept of sustainable development in a way that can be specified and applied to the current society. In general, the concept of sustainable development

consists of three main dimensions: environment, economy, and society, commonly known as 'The Triple Bottom Line' in the sustainability-related community. This definition has been extended and applied to the concept of sustainable development all over the world, and it is currently positioned as an important axis in discussing the direction of sustainable development (see Figure 1).

Figure 1. Concept of The Triple Bottom Line (Datta and Chaudhuri, 2018)



In this regard, "Transforming Our World: The 2030 Agenda for Sustainable Development," adopted at the UN Summit in September 2015, addresses the challenges facing the world. While proposing possible solutions, "Sustainable Development Goals (SDGs)" was presented (see Figure 2). It provides 17 sustainable development goals consisting of social, economic, and environmental development and a set of 169 detailed goals (IFLA 2015), which were officially announced on January 1, 2016. Currently, the UN's Sustainable Development Goals are playing a role as a medium to integrate three aspects of economy, society, and environment and to connect various institutions to solve problems occurring all over the world. Since sustainable development requires a holistic approach to economic, environmental and social issues, however, it should be able to pursue the possibility of improving the quality of life or work of people, and thus many social institutions including libraries should play an important role in supporting sustainable development.

Figure 2. 17 Goals of Sustainable Development (IFLA, 2015)



2.2 Sustainable Development and the Roles of Libraries

The social and informational responsibility of library communities is in line with the adoption of the UN 2030 Agenda. Many countries already recognize the important roles of libraries for supporting sustainable development. In addition, as a basis for community members and as a place for lifelong learning, the cooperative relationship with library communities can be a great asset to the UN. Thus, the UN expected library communities to play informational and social roles from various perspectives in the current environment and in the future (IFLA 2018).

Accordingly, in August 2002, IFLA declared "Statement on Libraries and Sustainable Development" in Glasgow, Scotland, on the event of its 75th anniversary (IFLA 2002). Since then, IFLA has reached an agreement on the final draft of the "UN 2030 Agenda" through discussions with many stakeholders including UN member states. IFLA welcomed and declared its continued support for the "UN 2030 Agenda," which can achieve the results of access to Information and Communication Technology (ICT), access to information, universal literacy, and protection of cultural and natural heritage (National Library of Korea 2017).

As such, library communities occupy an important part in achieving Sustainable Development Goals, and to play a role directly linked to the achievement of these goals. In addition, problems such as the digital divide between the rich and the poor (Goal 1), gender equality (Goal 5), and employment inequality (Goal 8) can be addressed with support through library communities. Library communities are also expected to contribute to achieve the formation of an industrial base (Goal 9) and awareness of the natural environment (Goal) 6, Goal 13, Goal 14, Goal 15). In this way, library can play a role as an institution that can enhance the social and informational level of the current society and as an institution that can support the achievement of the Sustainable Development Goals. It can also serve as a tangible and intangible platform that connects people and communities.

Through these functions and roles, libraries can be a center of social cohesion. In this respect, library communities should support community members socially, informationally and culturally. They also play a pivotal role in closing digital divide by enhancing digital literacy of general people.

3. CLOSING SMART DIVIDE THROUGH LIBRARY

3.1 Implication of Digital Divide

The development of information technology and the widespread dissemination of wireless networks leads to the establishment of a digital convergence environment where networks, information, media devices, and contents are converged. In particular, the use of smart devices triggered by smartphones has radically changed people's information activities. Smart devices are becoming indispensable tools for people to obtain, express, transmit and utilize information. In addition, these devices have become the core devices for education because many people are on the Internet to get the access to educational information and many countries offer school classes via Web. Thus, smart devices are becoming a key tool not only for people's information activities but

also for education.

COVID-19 is entirely changing our lives and the way of education. Non-face-to-face services are provided in various fields such as education, culture, economy, and medical care. Among these, the field of education is significantly affect by COVID-19 because of the absence of face-to-face education in school. In this situation, people use smart devices such as tablet PCs and smartphones in addition to the existing information devices for information activities and education in school. It is causing an intangible and notorious gaps in education between those who can utilize smart devices and those who cannot.

Smart devices enhance information activities at both the personal and social level by allowing various types of information to be efficiently utilized using a single device. In addition, it performs a function of supporting communication between people by utilizing various applications based on wireless networks. In contrast, smart devices are complex media, and they have the characteristic that they require a certain level of knowledge or competency to fully utilize the functions of those devices. As a result, for those who cannot fully utilize smart devices, the convergence environment of information and media through smart devices may lead to a situation in which they face a social problem of the digital divide.

Although the digital divide is a concept that appeared with the dissemination of personal computers, the traditional quantitative digital divide focusing on the access to information has been evolved into a qualitative digital divide resulted from the utilization of smart devices. Particularly, in the current situation with the pandemic of COVID-19 with the absence of face-to-face education, the traditional concept of the digital divide is further evolving into the smart divide.

3.2 Evolving Digital Divide into Smart Divide

The smart divide is a term coined in a research by Lee (2016). It is defined as an intellectual divide that occurs within a group using smart devices or a qualitative gap determined by the competency to use smart devices (Lee, 2016, 262). Based on the definition of Lee (2016), Li, Chen, and Wu (2020, 560) describes the concept of the smart divide as an evolutionary aspect of the digital divide closely related to people's digital literacy in relation to economic level, race, gender, age and place of residence.

Taken together, the smart divide is a diversified digital divide that occurs depending on the competency of the use of smart devices. In particular, it can be seen as a concept that includes not only the degree of possession of smart devices, but also the gap resulted from how much information can be accessed and utilized by using smart devices. If the traditional digital divide has been the inconvenience caused by the inability to use ICT, the smart divide goes beyond simple inconvenience and expands to economic, social, cultural, and informational gaps, leading to various types of social and informational inequality. Thus, in order to solve the social problem of the smart divide in the current society where smart devices are widely distributed, a more in-depth approach should be prepared, different from the existing approaches to resolve the digital divide.

In particular, in the current situation where face-to-face education or information activities are not sufficiently conducted, educational support from various aspects should be provided through libraries in order to close the smart divide. This is not simply for supporting information activities, but has a meaning as an important activity to address the informational, social, and educational divides in our society.

4. ROLES OF LIBRARY COMMUNITIES IN THE ERA OF NEW NORMAL

4.1 Supporting Information Activities for Sustainable Development

The support of information activities is one of the keys to sustainable development. In this respect, libraries, which has contributed to society for a long time as a hub of knowledge-information, can be a core institution for supporting information activities to achieve sustainable development. However, libraries should not only focus on supporting information activities, but also consider creating an environment in which all community members can access and use information through libraries.

One of the ways in which libraries can support sustainable development is that libraries provide informational support so that community members can get the access to information they need from libraries (Shaffer 2018). In addition, library communities provide various information services to the community and should play a role as a driving force for social change at both individual and societal levels.

4.2 Supporting Educational Activities for Sustainable Development

Library is one of the most convenient institutions for everyone to use. It provides a learning environment that everyone can equally use and participate without disparity or discrimination. Library provides wide range of information resources for learning, as well as physical environments such as reading rooms, facilities, and facilities. In addition, library operates various lectures and programs using facilities, spaces, and library collection. At the same time, it supports lifelong learning for community members, and additionally should provide an environment to build a wide human network among community members.

In terms of supporting sustainable development, however, library should also consider providing an active educational environment, not passive information services such as providing facilities and educational programs. In other words, the implementation of sustainable development through libraries is not only tangible development but also intangible development. Also, indirect development that lays the foundation for development is also included in its scope. Thus, the providing equal access to information and a learning environment is the core of the library's mission and the essential value of librarians.

As such, library not only plays an informational role, but also plays an educational role for community members. This is closely related to the traditional role of library as a hub of information. In particular, reference service that provides and guides the use of information resources needed by community members for various purposes is one of the important functions of the library as an educational institution of community.

In the current information environment, these educational functions are evolving into a wide range of information services that can be accessed and used anytime and anywhere beyond physical limitations. Thus, it is necessary for library communities to consider the evolution of library to an embedded library service that not only provides information services limited to the library, but also performs linkage with information resources outside the library.

4.3 Closing Smart Divide through Library

Library is an institution closely related to the implementation of the Sustainable Development Goals. It can make a significant contribution to addressing problems such as poverty, education and social disparities. For a sustainable society, various disparities must be resolved. Library and information service can be one way to solve the problems such as the digital divide, evolved smart divide, and information inequality, which are currently recognized as social problems (IFLA 2018). In order to close the smart divide, library should actively provide effectively and efficiently information and educational environment. Additionally, it should target everyone who needs it, not just the info-poor.

As such, library can play a role as a social and informational agency that connects information and people. Library is a hub of knowledge information where information is collected and utilized from past to present, which can contribute to the construction of informationally equal society. However, this role cannot be fulfilled by simply expanding library collections. In order to quantitatively and qualitatively enhance the various social functions and to close the smart divide, library needs to actively build a human network. In other words, it is possible to establish a cooperative system that can solve various social problems through communication within the community. It can also increase the possibility of sharing necessary information and close the social and informational gaps (Lee and Park 2019).

Through these social, informational, and educational functions, library can improve the quality of life of community members by performing various roles in the community and society as a whole based on information services, which in turn lays the foundation for the sustainable development of society. Library provides a variety of informational and educational programs that can enhance the cohesion of society. It can have a positive impact on securing the sustainability of society, such as bridging social gaps, providing opportunities for lifelong learning, and forming social and cultural capital.

In order to efficiently and effectively conduct these functions, however, librarians are the most important among the many ways to support sustainable development. A library cannot exist without librarians, and a sustainable library cannot exist without librarians. In particular, if the level of information service by librarian enhances, the roles of library community will be recognized by people and will be more likely to evolve into a more valuable professional service.

5. CONCLUSION

COVID-19 is causing many serious social problems and social issues throughout society. Although the problems resulted from this pandemic situation can be discussed in various aspects, it can be considered from two important but not widely recognized issues: continuing the sustainable development and the evolving digital divide.

These issues are not just limited to the development of society and information activities, but cause many social problems, including social divide, educational divide, and information divide. In particular, the gaps in education in schools is getting worse, which can lead to social polarization rather than social cohesion. Even

worse, the current pandemic situation is resulted in the evolved digital divide, which is termed as the smart divide. It becomes a more serious social and informational problem than ever.

In order to address these problems and support sustainable development of society, library needs to play a role as a social and community-oriented institution that can close the social, educational, and informational gaps caused by COVID-19. To fully function to address these problems, it is necessary to raise awareness about libraries and librarians, and to make efforts to strengthen the roles of library communities so that they can perform their professional roles. This will be the ideal and substantial role of library in supporting sustainable development in the current society and in the future.

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POST-GRADUATE DIPLOMA IN LAW LIBRARIANSHIP THROUGH DISTANCE MODE: A CASE STUDY OF TAMILNADU DR AMBEDKAR LAW UNIVERSITY, CHENNAI

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Abstract

LIS education in India has completed more than a century and the research has completed about sixty years.Law librarianship is a challenging profession and information requirements of the user in this field vary. The present state of formal or informal education in Law Librarianship in India is apparently nil. However, the Tamil Nadu Dr Ambedkar Law University (TNDALU), Chennai is an exception to this which offers Post Graduate Diploma in Law Librarianship through distance mode. This paper presents a case study of how the TNDALU is offering a Post - Graduate Diploma course in Law Librarianship through distance mode. It also explains the course contents, methods followed in imparting the course, infrastructure needed, planning of personal contact programme (PCP), student's feedback, challenges in the adoption of ICT in imparting course in Law Librarianship, task ahead. Argues that Department of Library and Information Science of Universities in India must introduce a special paper on Law Librarianship or offer a degree/diploma programmes for Law Librarianship.Concludes that education in LIS in general and Law Librarianship in particular through DE needs a continuous review, discussion, experimentation and feedback.

Keywords: Law Librarianship- LIS education- Distance Education- Tamilnadu Dr Ambedkar Law University- Tamilnadu- Case study

INTRODUCTION

Library and Information Science (LIS) education is linked with the growth of libraries. The origin and growth of libraries are conditioned by the educational and cultural conditions of the society at any time. Training and education for Library and Information Science in India dates back to 1911 and marched almost with

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developed countries of the world. Since then, it is gradually evolving and it has spread its roots though out the country. LIS education in India has completed more than a century and the research has completed about sixty years.At present, LIS education is provided by a variety of institutions such as traditional universities, open universities, deemed universities, polytechnics, affiliated colleges, professional associations, documentation centres etc. Currently more than 150 institutions are offering courses leading to bachelor's degree and about 100 universities offering Master's degrees and a good number of universities offer M.Phil and doctoral programmes in LIS.

Dr. S.R. Ranganathan has played an important role in standardising and developing the courses at various levels, course content, training of teachers, as well as research in LIS. There are few more pioneers who have also made significant contribution to LIS education in India. In India, Open and Distance Learning (ODL) has its roots in the early sixties. Since then, there is an ever increase and growth in the learner's participation in ODL. The term ODL has been used with many names such as distance education,distance mode, open learning, correspondence course, etc. It is mainly confined to the courses in arts and social sciences and humanities subjects at graduate and postgraduate levels. The number of ODL institutions is also considerably increased due to the economic viability of the parent universities and as a means of additional resource generation. Accordingly, the traditional universities have established separate institutions for ODL. Various names are being used like, Institute of Correspondence Education, Institute of Correspondence Courses, Directorate of Distance Education, Institute of Distance Education and the like. ODL in LIS started in the early eighties by Dr. B.R. Ambedkar Open University (the then Andhra Pradesh Open University), Madras and Annamalai universities. Subsequently universities like Alagappa, Karnataka State Open University, Periyar university, Madurai-Kamaraj University, Kuvempu university and many other universities have started courses in LIS through their ODL/ DE mode.

LAW LIBRARIANSHIP AS AN ACADEMIC DISCIPLINE

Librarianship exhibits the essential characteristics of the established professions. Law librarianship is a challenging profession and information requirements of the user in this field vary. It offers many niches and specializations that provide opportunities to enhance job satisfaction. Examples include foreign and international law, government documents, patents, taxation, computer-related services, library administration; and special collections such as archives and antiquarian books.It is a challenging profession and information requirements of the user in this field vary. *"The law library is truly a vital factor in the administration of justice, an institution of extra-ordinary social significance in a free society."*It, especially the librarianship in judicial institutions, is different from librarianship in any other discipline. This aspect is more appropriately explained by **Prof. Igor I. Kavass(1975),** when he says that *"the reason for law libraries being different from other types of libraries is that they serve a profession which is literally unable to exercise its work without the use of books".*Law libraries play an integral role in the legal information management in courts, law firms and academic institutions in support of justice system in the 21st Century by helping the public access the legal system. Law librarians perform tasks such as researching, analyzing, and evaluating the quality, accuracy, and validity of sources; teaching and training; writing; managing; and procuring and classifying library materials.

The modern approaches to information management poses challenges to law librarians to pay attention information flow and access in the international arena, with the appropriate directions law libraries play and integral role in helping researchers and ligaments to provide understanding their legal rights and responsibilities and related references in the concerned case.Though law librarians have been acknowledged as instrumental in legal education and law practice, questions about the need for law librarians and law librarians' ability to adapt to new demands of conducting and teaching legal research have been raised. Law librarianship also faces debates as to whether it should be considered a distinct profession by those who do not see law librarians as having specialized qualifications that set them apart from other librarians.

The Law Library is still the "*laboratory of the law school*." That laboratory has just taken on a different appearance **(Fariss, 2012).**A few tasks that law librarians commonly undertake are:

- Managing the operations of the law library, including monitoring budgets and allocating, organizing and disseminating legal resources.
- Conducting in-depth research in wide range of areas including practice-specific areas of law, business intelligence, public records, legislative history, medical and news/media.
- Training lawyers, students, staff and others on the use of Internet-based legal research programs such as Westlaw, Lexis/Nexis, and emerging electronic resources such as Google Scholar, electronic journals, on-line court dockets and legislative materials.
- Conducting periodic reviews of new and existing electronic resources with an eye toward improved service and research efficiencies.
- Promoting library services and resources to other departments, students, vendors and the public.
- Coordinating technical services and troubleshooting technical issues.
- Performing various cataloging procedures for all types of library resources.
- Supervising and evaluating the work of clerks, librarian assistants, and other staff **(Sane, 2016).**
- It is felt that changes are needed to empower law libraries.
    - Law libraries are seeing a changing user base. They need to move towards providing a broader range of services.
    - They need to fully appreciate the dramatic changes in legal landscape. They need to re-configure their space to meet the needs of different constituencies.
    - They need to re-think and re-conceptualize their mission.
    - Technology implementation to reduce the cost of delivering traditional library services.
    - To provide broader services, law libraries will need to train staff, to able to provide them and assist in the development of those services and tools **(Chadha, Priya Rai and Akash,2014).**

In order to deal with these situations a special training is needed to the professionals to manage the law libraries. Hence it is necessary to design a separate curriculum and thus it becomes an academic discipline.

EDUCATION FOR LAW LIBRARIANSHIP IN INDIA

Law librarianship in India is still a new field and much needs to be done for the development of law libraries in a coordinated manner. Since the essential role of law librarians is to teach users how to locate or use sources for legal research. Law librarians are specialists in their field and the general impression is that they must have training beyond a library degree. Formalized law library education can better train potential law librarians with the necessary skills and knowledge to ensure better and more competent librarianship. For law librarians to properly support the needs of their organizations, they must have a good educational background with specialized knowledge in legal information. This is a challenge to all the LIS Schools in India that offer Library and Information Science to rethink their curriculum/degrees, as there is currently no such course being offered. The present state of formal or informal education in Law Librarianship in India is apparently nil. It will not be any travesty of truth, if we say that education in this subject is practically non-existent with an exception to one institute. The Tamil Nadu Dr Ambedkar Law University(TNDALU), Chennai is an exception to this which offers Post Graduate Diploma in Law Librarianship through distance mode.In India although LIS courses at different levels starting from certificate to Master's and research levels are offered by a number of universities, polytechnics, and other private educational institutions, but the course on Law Librarianship at post-graduate diploma level is offered only in Tamil Nadu Dr Ambedkar Law University, Chennai, since 2013 onwards through distance mode.

NEED TO OFFER LAW LIBRARIANSHIP COURSE THROUGH DE MODE

The need to provide Law Librarianship education through DE mode is dueto: -

- Increase the number of professionals required to run the different types of Libraries and documentation centres.
- Develop the existing knowledge and skills of the professionals already working in different Libraries and information centres.
- Remove the geographical barriers and time constraints.
- Allow flexibility in learning according to the need of the learners.
- Reduce the social, economic and other barriers faced by the learners.
- Benefit the learners by providing most useful and cost effective means of enhancing professional skills and obtaining the professional degree.
- Provide opportunity for career advancement and create opportunities in reaching the unreached.

POST GRADUATE DIPLOMA IN LAW LIBRARIANSHIP

As already stated that the Tamil Nadu Dr Ambedkar Law University, Chennai is offering Post Graduate Diploma course in Law Librarianship through distance education mode since 2013 onwards. The course contents (**Appendix)**are well designed and structured keeping in view of the need for managing the Law libraries. A total of six papers (three papers per semester) have been framed and formed the course contents.

The following are the papers:

PGl001 Foundations of Library and Information Science

PGL 002 Law Library Management

PGL 003 Legal Aspects of Information

PGL 004 Legal Information Sources and Services

PGL 005 Information Technology

PGL 006 Project Report and Comprehensive Viva – Voce

INFRASTRUCTURE NEEDED FOR TEACHING THIS SUBJECT

Since the education for Law subjects is in growing trend, naturally more people are required to be trained to manage the Law Libraries. The general LIS education will not be sufficient to manage the law library effectively and hence there is every need for education and training in Law Librarianship must be well planned. The use of ICT in the education system has influenced the traditional ways of learning and imparting and also the interaction between students and faculty. It has proved to have helped enhancing the teaching and learning environment and provide enrichment in the learning process **(Duhaney,2000).**The following are some of the requirements for offering this course:

- Teacher with practical knowledge with Law subject and managing law libraries are needed. In other words, mere text book knowledge is not sufficient to teach this subject.
- Practical knowledge with using the case laws and legal reference sources including databases is essential. LIS professionals working in major Law Libraries may be drawn for this purpose. They may be asked to deliver extension lecturers that would facilitate in molding the learner's mind to alert and in widening the ideas about the subject.
- In addition to the lecture-cum-discussion methods, seminars, group discussion, case studies and audio-visual methods may be exploited. These methods would provide a strong basis for original thinking to understand the issues inherent in the subject.
- Inter-discipline collaboration may also be considered as an effective means. Persons associated with the practice of Law (senior lawyers), psychology, management and information and communication technology (ICT) may be associated and take an active part in the teaching programme of this subject.

METHODS USED IN IMPARTING LAW LIBRARIANSHIP COURSE THROUGH DE MODE BY TNDALU

The methods of instruction include both the supply of printed lessons known as study materials and the personal contact programmes known as PCP classes. The PCP is arranged to provide face -to -face relationship between the teacher and the student; necessary clarification on the subject; lectures and practical guidance. In addition to the staff in the university library, other senior faculty were from other institutions have been invited in the conduct of the PCP classes.

TNDALU has adopted the following methods of instruction to reach their students;

- Supply of learning materials in print media
- Conduct of contact classes
- Sending of feedback course or assignments
- Student counselling

In designing the schedule of PCP classes four days were allotted (Two weekends, Saturday and Sunday) and four classes of two hours' duration per day has been organised.

Feedback

Students who participated in the PCP classes felt that the contact programmes were very useful in understanding the difficult topics. The faculty also revealed that class room discussions are lively and the interaction of the students is in no way inferior to that of regular students.

ADOPTION OF ICT IN LIS EDUCATION THROUGH DISTANCE MODE: CHALLENGES

Indiais considered as one of the leading countries in the world probably occupies the fifth position in input and output and contribution to the development of the LIS content in study and research. It is observed that number of LIS schools has multiplied in the post-Ranganathan's era. Correspondingly the facilities and opportunities are also equally expanded. However several issues are being raised today in the ICT era concerning the expansion and proliferation of LIS education in the Knowledge society.

The ICT advancements made in the last one decade are creating new emphasis for educators on electronic information tools. Electronic means, like the Internet, Web, and telecommunication, provides educators new tools/medias. At the beginning, the Internet was intended to be a network (intranet or extranet) that would facilitate communication and collaboration among students, scholars and educators in higher learning institutions, corporate sectors and government agencies etc.

ICT has greatly enriched distance education , by providing content and interactive features. ICT provides:

- Expanded interaction with faculty through e-mail, bulletin boards, and multimedia lectures.
- Student to student interaction through e-mail, bulletin board, chart room discussions.
- Well presentation through graphics, animation, audio and video.
- Doorstep in access to course-related content such as lecture notes, references, and links to relevant external sites.
- Interactive learning and assessment tools.
- Computer Assisted Learning (CAL) packages
- Extensive use of mass media such as Radio, Television.
- Supply of CD-ROM, Audio, Video lesions along with the print form

Web-based training (WBT) is an innovative approach to distance education in which computer-based training is transformed by the technologies and methodologies of the World Wide Web (WWW), the Internet, and Intranets. It allows self-directed, self-paced instruction in any topic. WBT is media-rich training fully capable of evaluation, adaptation, and remediation that can provide the available tools to organize and deliver content into well-crafted teaching systems. WBT has certain distinguishing characteristics, which makes it an ideal tool for bibliographic instruction. WBT is an interactive tool. It expands upon computer-based training with activities like discussion forums, mail lists and chats sessions. The user sets his/her pace and direction.

The challenges of technology – mediated education in LIS are formidable. Those challenges are greatly magnified, when viewed in the light of the expansive goals of an institution. In order to delivery of distance education, the following issues may be listed in the context of Indian scenario;

- Do we have sufficient, viable and functional infrastructure facilities to augment the technology based instruction?
- Do our finances permit to go for the Internet based resources delivery?
- Do our learners can use the "Virtual Environment" or Virtual Laboratories" or "Virtual Field Courses"?
- Whether the computer mediated instruction can ameliorate the potential decline in education standards?
- Whether the learners are really the information literate in the academic community?
- Whether the faculty is ready to take challenges to welcome the technology based instruction and design and develop the modules on such lines?

Task Ahead

It is clear that the TNDALU is seriously attempting to maintain the standards required for offering a professional course such as Law Librarianship. However, there is scope for improvement. In general distance learning in LIS in general and Law librarianship in particular has come to stay as a viable system in all the universities in the years to come.As a matter of fact, Tamilnadu is dominating in DE in the subject of LIS offering courses

from Certificate to M. Phil levels. But all these institutions are still using traditional methods in imparting courses. Therefore, it is high time that ICT must be used in imparting DE courses and Law Librarianship is not an exception.

- Library and Information Science faculty, library professionals and IT specialists need to work together to design and develop course modules and Computer Assisted Learning (CAL) interactive packages. CAL tutorial packages on cataloguing, database searching, library skills, library tutor, databases-access, and Internet are already produced in the West and widely in use **(Dale and Dickman, 1999).**
- Periodical curriculum updating and developing curriculum for specific situation education and training programme.
- Provide collaborative production of learning materials in LIS, both print and non-print media, among LIS educational institutions.
- LIS educators and professionals shall establish stronger networks to uphold the core values and basic philosophy of librarianship.
- Periodical revision and upgrading of the course materials need to be carried out by the department.

CONCLUSION

Education for LIS is no longer only technical, but must include consideration of new cognitive, social and situational processes. Today the library and information science education is no more an education to the mangers of libraries only. But it has become an education to the consumers of knowledge from libraries. It is a change from managing libraries by librarian to managethe flow of information by one and all and it is an integral part of general education. Earlier the trend was that the persons learn this education and the learners become librarians. Now the trend is that the professionals teach this science and learners choosedifferent walks of life and use this education in the occupation to manage the information (**Gangadhara Rao and Ramesh Babu, 1988).** Law library's role in legal education is necessary and essential, not only because of the tremendous challenges that law libraries face as the information they collect and organize has moved largely from print to digital formats. Most importantly, law libraries must hire bright and talented born-digital law librarians, unfettered by the trappings of old tools and desires for relationships with faculty scholars that may not be possible, but armed with new understandings of what library support for legal scholarship means in the digital environment. And law library directors must be prepared to set them free **(Danner, 2010).** Law librarians had the opportunity to take a leadership role in developing a new technology-savvy profession of legal information professionals.Department of Library and Information Science of Universities in India must introduce a special paper on Law Librarianship or offer a degree/diploma programmes for Law Librarianship.

It can be stated that the present state of LIS education in India in general and distance education in particular needs to be structured and reoriented to support the changing needs of the society as well as the library and information centres. Let us hope that education in this area will soon spread in our country. This, in turn, would facilitate the LIS professionals to discharge their professional responsibilities in the 'Information-basedSociety'. Distance education will not close any LIS programmes and it probably, will not keep any weak programmes alive. But directly or indirectly it has the potential of making all LIS programmes stronger,

more vibrant and more responsive to the professionals and the society. Therefore, education in LIS in general and Law Librarianship in particular throughDE needs a continuous review, discussion, experimentation and feedback. Thinkers say, "*Nothing is static and everything is in a state of flux*". The same is true with LIS education. Therefore, to conclude in the words of **Lancaster (1983),**"*We must shift the focus of our professional concern away from the Library as an institution and towards the skilled professionals, who will become a professional practitioner on par with medical and legal practitioners".*

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APPENDIX

POST GRADUATE DIPLAMO IN LAW LIBRARIANSHIP

SYLLABUS

PGl 001 FOUNATIONS OF LIBRARY AND INFORMATION SCIENCE

UNIT I	Concepts – History of Library and Library Science – Role of Library in the Knowledge Society
UNIT II	Legal Concepts relating to Judgments – Hierarchy of Benches – Information Literacy about Law Related Aspects
UNIT III	Types of Libraries – Functions – Five Laws of Library Science
UNIT IV	Library Ethics in relation to Legal Professions
UNIT V	Librarianship as Professions – Professional Organizations with Reference to Law

PGL 002 LAW LIBRARY MANAGEMENT

UNIT I	Principles of Management – Library Management
UNIT II	Organization – structure of Law Library – various sections
UNIT III	Law Library Administration – User Friendly approach
UNIT IV	Functional Management of Law Libraries
UNIT V	Preservation of Legal Information Materials

PGL 003 LEGAL ASPECTS OF INFORMATION

UNIT I	Impact of IPR on Libraries – Legal Implications of Information Technology on Law Libraries
UNIT II	Technologies and Methodologies of reading judgments – Laws and Acts – Legal Terminology – Use of Law – Jurimetrics
UNIT III	Library Legislation – National and International Perspectives
UNIT IV	Impact of Law in Resource Sharing/Consortia
UNIT V	Specific aspects of Copyright Law relating to Libraries

PGL 004 LEGAL INFORMATION SOURCES ABND SERVICES

UNIT I	Types of Information Sources – Print – Primary Sources, Secondary and Tertiary Sources
UNIT II	Non Documentary Sources
UNIT III	Online Legal Databases – CD – ROM Databases – e books, e – Journals
UNIT IV	Information Services – Types – reference Service – Current Awareness Service – Selective Dissemination – Indexing and Abstracting Services – e – based services
UNIT V	Current Trends and Developments in Legal Information Sources and Services – Tools for Citation Indexing – Blue Book

PGL 005 INFORMATION TECHNOLOGY

UNIT I	Introduction to Computer – Generation of Computers – Output and Input Devices
UNIT II	Hardware and Software Infrastructure
UNIT III	Information Communication Technology
UNIT IV	Networking Technologies – LAN, WAN – MAN – INTERNET – INTRANET
UNIT V	Planning for Law Library Automation – Current Trends and Issues

PGL 006 PROJECT REPORT AND COMPREHENSIVE VIVA – VOCE

INFLUENCE OF LIBRARY ENVIRONMENT, INTERNET CONNECTIVITY, INSTITUTIONAL REPOSITORIES ON UTILIZATION OF INFORMATION RESOURCES BY STUDENTS OF FEDERAL UNIVERSITIES IN SOUTH, NIGERIA

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Dolly C. Ogu[9]

Abstract

This study examined the influence of library environment, internet connectivity, institutional repositories on utilization of information resources by students of federal universities in South South, Nigeria. the study was guided by three research questions and three hypotheses. The researchers adopted simple linear correlational research design. The instrument that was used to elicit data for this study was a researchers'-made questionnaire which was rated using the four point Likert scale. The population of the study was 4,503 registered library users of the federal universities studied out of which a sample of 450 was derived from 10% of the population. In analysing the data collected, Pearson Product Moment Correlation (PPMC) was used to answer the research questions while the hypotheses were tested at 0.05 alpha level using t-test statistics.The findings revealed that: there is a very high significant relationship between library environment and utilization of information resources; there is a very high significant relationship between internet connectivity and utilization of information resources and there is a very low no significant relationship between institutional repositories and utilization of information resources.Based on the findings, the researchers recommended that: conducive library environment should be provided for effective function and comfort of the library users; the library should be connected to an efficient internet service provider and made accessible to the students as far as they are within the school premises; and the university library should create awareness of the existence of institutional repositories so the students can make use of the resources contained therein.

Keywords: Library, Environment, Internet, Institutional Repositories, Utilization, Information Resources

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INTRODUCTION

The establishment of university libraries helps in meeting the diverse information needs of the academic community which comprises of students (undergraduates and postgraduates), lecturers, administrators, and staff. Undergraduates are mainly the users of the university library. An undergraduate is a student who is enrolled in a tertiary institution that has not graduated yet. Olorunfemi and Ipadeola (2021) opine that library users are very essential in any university library; users are the most important component in any library environment because the mission of every academic library is to provide excellent services to the users. Libraries are collection of sources of information that are available for reading, borrowing and for reference.

Knowledge and information which are stored in the library are referred to as information resources. University libraries have a variety of information resources (print and non-print materials) which are to be utilized by the students. Onwubiko and Uzoigwe (2012), see information resources as the totality of information materials that form a library collection. The print materials are in the form of books (monographs) and serials, while the non-print materials are in the form of audio-visual materials (multi-media resources). Akanwa and Udo-Anyanwu (2017) state that recently, information resources in the library have evolved to include electronic information resources such as: e-books, e-journals, preprints, e-thesis or dissertation among others and students are expected to use these information resources to gain knowledge of subjects or courses taught in the university. Effective library services are only possible when there is qualitative and quantitative adequacy of relevant information resources.

It is important to note that the effectiveness of a library does not depend on the collection or resources and facilities only but also on the users. The functions and services of a library cannot be said to be effective without their utilization by users. Library utilization however, refers to the extent of usage of libraries by students. In view of this, students in tertiary institutions especially the university studied make use of the library for academic materials, assistance and guidance for research (Echem, 2018).It has been observed that in Nigeria, there is poor reading culture hence there are certain factors that need to be available for users to make optimal use of libraries. These involve but not limited to library environment, internet connectivity and institutional repositories (IR).

The conduciveness and adequacy of the library environment play effective role in the utilization of the library and deriving satisfaction from its resources by users to a great extent. A good library is that whose environment is conducive and attractive, free from noise, has durable and comfortable furniture, well ventilated, good lightening/illumination etc., for meaningful study. Any library where these facilities are inadequately provided could result in low level of use by the undergraduate students. McVey and Nock as cited by Oyedum (2011) assert that things such as light, temperature and sound if not properly incorporated into the library design may negatively affect human beings and impede learning. The undergraduate students, for instance, who use the library resources in carrying out any type of academic work or for other reasons, will be encouraged to do so if only the library environment is conducive. Environmental factors such as noise, ventilation and lighting are variables that are likely to influence quality information service delivery to the clientele. This is because no proper concentration can be achieved if the library environment is noisy, dark or stuffy. Adequate lighting of libraries could be derived from natural light or even an electric power plant and is a very crucial requirement

in libraries. Without adequate lighting, a library cannot perform its functions, particularly when it is expected to open to users till late hours. The library environment must also be environmentally friendly and safe.

In this era of Information and Communication Technology (ICT), information can be accessed anywhere at any time through the internet. Users now prefer to stay at the comfort of the homes to access the information they need. this, if allowed will strip the library of its users. Libraries have integrated internet services to their users, in this case mostly students. Having internet connectivity in the library can be a motivating factor to attract the students especially when it is at no cost. Users gain easy access to online resources such as full text, e-journals, e-books, library catalogue, email, etc. through internet services. They make use of internet usage opportunities provided by the library to communicate, share knowledge, ideas, disseminate and store information and get satisfied. Muhammed and Garko (2012) state that broadband internet access is an essential ICT services to the library which improve information flow and ease exchange and sharing of ideas between library users and libraries.

Institutional repository is another factor that can enhance utilization of university libraries. Institutional repository is a compendium of research output emanating from a particular university. Users are exposed to the research world through free and unrestricted online availability of resources stocked in institutional repositories. Adewumi (2012) observe that institutional repositories operate well in an open access environment which offers free access to digital content without restrictions. In recent years institutional repositories have become effective in disseminating scientific data and scholarly communication (Okumu, 2015). Visibility of research work is highly motivational and can influence utilization of the library.

It is based on this background that this study on influence of library environment, internet connectivity, institutional repositories on the utilization of information resources by students of federal universities in South South, Nigeria is carried out.

STATEMENT OF THE PROBLEM

Information resources in print and non-print formats are the bedrock of library services. That is to say that without them, no meaningful service will be rendered in libraries. The availability of information resources enhance the achievement of the goals and objectives of university libraries. The potentials of these resources can only be achieved when they are effectively utilized by library users. Effective utilization of library resources improves the reading habits of students and complement teaching and learning done in the classroom among other benefits. It has however been discovered that the university libraries are not adequately utilized by students. The researcher wonders if it could be as a result of factors such as library environment, internet connectivity and institutional repositories. This is what this study is set to find out.

RESEARCH QUESTIONS

The following questions are posed for the study:

1. What is the relationship between library environment and utilization of information resources?
2. What is the relationship between internet connectivity and utilization of information resources?
3. What is the relation between institutional repositories and utilization of information resources?

HYPOTHESES

The following hypotheses stated in the null form are formulated to guide this study at 0.05 level of significance:

Ho_1: There is no significant relationship between the library environment and utilization of information resources by students of federal universities in South South, Nigeria.

Ho_2: There is no significant relationship between internet connectivity and utilization of information resources.

Ho_3: There is no significant relationship between institutional repositories and utilization of information resources.

LITERATURE REVIEW

The university library is a place where information resources are acquired, organized, processed, stored and made available to meet the information needs of students, lecturers and the entire university community. The library is set up to serve its parent institution, considered as an organ around which all academic activities revolve (Onifade, Ogbuiyi&Omeluzor, 2013). The university library is seen as a reservoir of knowledge where information resources are kept in diverse forms like books, journals, online data basis and other sources. As a repository for knowledge in all forms and shapes, it brings the user in contact with the world in fulfillment of its function. (Agbo&Onyekweodiri, 2014). As such, university libraries in Nigeria must continue to remain relevant by ensuring that their resources are not only acquired but also used.

Utilization of information resources is essential for the justification of the existence and survival of any university library. Information resources' utilization in academic libraries is a process comprising of initiation, selection, formulation, collection and preservation (Kuhlthau cited in Echem, 2018). The utilization of information resources is a function of how proper the resources are organized and made available for use. There are certain factors that influence the utilization of university libraries. They include: library environment, staff attitude, internet connectivity, internet connectivity, user education, institutional repositories among others.

An environment entails the conditions or influences under which any individual or thing exists, lives or develops. It contains influencing elements or conditions. The university library environment encompasses all

the circumstances, people, events around the library which can have potential effects, positive or negative on the library usage. The library environment according to Akanwa, Okorie and Uwazuruike (2018) is usually made up of three elements, which include the following:

- System environment within which the library's freedom is circumscribed.
- The clientele environment which brought the library into being. The clientele or user therefore cannot afford to be a stranger in the world he represents.
- The physical plant or entity environment i.e. the library building, staff and its intellectual content.

Effective utilization of the library and its resources by users to a great extent depends on the conduciveness and adequacy of the entire environment of the library. Some scholars have carried out studies to determine the relationship between library environment and utilization of library resources and services. Echem and Udo-Anyanwu (2018) discovered that a strong, positive and significant relationship exist between the library environment and students' use of the library. Also the study of Folorunso and Njoku (2016) revealed that there is a significant relationship between the independent variables (library environment and user education) and the dependent variable (use of library). However, that of Okorie (2018) showed that the extent of relationship between the environmental factors and use of library information resources in the federal universities studied is very low, negative and significant.

The use of the Internet in the educational environment has facilitated easy access to many resources, and significant increase in information utilization. The internet provides a variety of services that enable communication and access to electronic information for many different purposes. These include: Telnet, File Transfer Protocol, Gopher, E-Resources/Electronic Journals, Online Databases and CD-ROM Databases facilities (Echem, 2018). Utilization of library resources by users in recent times is attributed to the availability of internet facility. The penetration of internet technology and computer revolution in the society has changed our way of life and a lot of transactions are now done electronically (Imhonopi&Urim, 2011). It is interesting to note also that the internet is seen as the storehouse of information and a frontier of knowledge across the globe. The internet provides a wealth of information in any subject field and students are using the internet increasingly as it occupies an important place among various information sources (Mostofa, 2011).Adedokun, Magaji and Makinde(2018) investigated the correlation between Internet use and library patronage among students in selected senior secondary schools in Ojo Local Government Area of Lagos State, Nigeria and discovered that there is no significant relationship between Internet use and library patronage.

Institutional Repositories (IR) is an online locus for collecting, preserving and disseminating in digital form, the intellectual output of an institution such as research journal articles, theses, dissertations, normal academic materials, administrative document, course notes, etc. (Malweta& Ella, 2017). In the simplest sense of the term, Adewole-Odeshi and Ezechukwu(2020) defined institutional repository as an electronic archive of the scholarly output of an institution, stored in a digital format, where search and recovery are allowed for its national or international use. Universities and other institutions are now addressing the issue of access to scholarly information using the IR. Despite many opportunities that present themselves, many countries in Africa and Nigeria in particular are yet to utilize the privilege offered by these resources to internationalize their research sources (Ezema, 2010). The full benefits of institutional digital repository can be achieved only if stakeholders involved are fully aware of its potential roles.On the status of institutional repositories in federal

and state tertiary institutions in Imo State, Nigeria, Iheanacho-Kelechi (2019) discovered that the institutions studied have little contents in their online repository limited to only technical reports and research articles. Nunda and Elia (2019) in their study on Institutional repositories adoption and use in selected Tanzanian higher learning institutions, found low adoption rate of institutional repositories among students.

RESEARCH METHODOLOGY

In this study, the researchers adopted simple linear correlational research design involving Pearson Product Moment Correlation approach. The instrument that was used to elicit data for this study was a researcher-made questionnaire which was rated using the four point Likert scale. The population of the study was 4,503 undergraduate students of the federal universities studied. The sample of the study was 450. This was derived from 10% of the population. Stratified sampling technique was used. Simple random sampling was further used to select individual respondents. In analysing the data that were collected for the study, the researcher used Pearson Product Moment Correlation (PPMC) to identify the level of relationships. The test of significance for the hypotheses was done at 0.05 alpha level using t-test statistical tool. **Decision Rule**: For the correlation analyses, the decision was as follows: 0.00 – 0.20 = very low relationship (VLR), 0.21 – 0.40 = low relationship (LR), 0.41 – 0.60 = moderate/fair relationship (M/FR), 0.61 – 0.80 = high relationship (HR) and 0.81 – 1.00 = very high relationship (VHR). If p-value≤0.05, reject null (H0) and accept the alternative (HA)

DATA ANALYSES AND PRESENTATION

Out of the 450 copies of instrument distributed and returned, 397 copies were found in useable form showing 88%. Analyses were carried out based on that. The presentations are organized according to the research questions and hypotheses.

Research Question 1:What is the relationship between library environment and utilization of information resources?

Table 1: Coefficient of Relationship between Library Environment and Utilization of Information Resources

		nrR^2	*Remark*
397	.906	0.821	VHR

(Key: Sample Size, Coefficient of Correlation , Coefficient of Determinant and Very High Relationship (VHR)

Analyses in Table 1 showed the coefficient of relationship between library environment and utilization of information resources. The coefficient of relationship between library environment and utilization of information resources is .906. This coefficient is positive, indicating that increase in library environment will bring about equal increase in utilization of information resources. The coefficient falls within the range of very high relationship (.81 – 1.00), indicating that the relationship between library environment and utilization of

information resources is very high. The coefficient of determination of 0.821 indicates that 82.1% of variation in utilization of information resources is accounted for by library environment.

Research Question 2:What is the relationship between internet connectivity and utilization of information resources?

Table 2: Coefficient of Relationship between Internet Connectivity and Utilization of Information Resources.

		nrR²	*Remark*
397	.806	0.650	VHR

(Key: Sample Size , Coefficient of Correlation , Coefficient of Determinant , and Very High Relationship (VHR)

Presented in Table 2 is the coefficient of relationship between internet connectivity and utilization of information resources. The coefficient of relationship between internet connectivity and utilization of information resources is .806. This coefficient indicates that there is a positive relationship between internet connectivity and utilization of information resources. This means that the better the internet connectivity, the better the utilization of information resources. The coefficient also falls within the range .81 – 1.00 for very high relationship, indicating that the relationship between internet connectivity and utilization of information resources is very high. The coefficient of determinant of 0.650 indicates that 65.0% of variation in utilization of information resources is explained by internet connectivity.

Research Question 3:What is the relationship between institutional repositories and utilization of information resources?

Table 3: Coefficient of Relationship between Institutional Repositories and Utilization of Information Resources.

		nrR²	*Remark*
397	.031	0.001	VLR

(Key: Sample Size , Coefficient of Correlation , Coefficient of Determinant , and Very Low Relationship (VLR)

In Table 3 the coefficient of relationship between institutional repositories and utilization of information resources is revealed. The coefficient of relationship between institutional repositories and utilization of information resources is .031. The coefficient falls within the range of very low relationship (.01 – .20), indicating that the relationship between institutional repositories and utilization of information resources is very low. The coefficient of determination of 0.001 indicates that only 0.10% of variation in utilization of information resources is accounted for by institutional repository.

TESTING OF HYPOTHESES

Ho_1: There is no significant relationship between library environment and utilization of information resources?

Table 4: Sample Size , Degree of Freedom , Calculated t-value , p-value, Tabulated t-value and Decision

			nt_{Cal}	$dfp - valuet_{Crit}$	Decision
397	42.54	397	.000	1.96	H_{01} is Rejected

The calculated and tabulated t-values are 42.54 and 1.96 respectively, while the p-value is 0.000. Since the calculated t-value is greater than the tabulated t-value and the p-value is less than the significant value of 0.05, the null hypothesis is rejected. Therefore, the relationship between library environment and utilization of information resources is significant. The p-value (0.000) tells us that the probability of getting a correlation coefficient of .906 in a sample of 397 students if the null hypothesis was true is very low or nearly zero. Hence, there is a significant relationship between library environment and utilization of information resources.

Ho_2: There is no significant relationship between internet connectivity and utilization of information resources.

Table 5: Sample Size , Degree of Freedom , Calculated t-value , p-value, Tabulated t-value and Decision

			nt_{Cal}	$dfp - valuet_{Crit}$	Decision
397	27.06	397	.000	1.96	H_{02} is Rejected

The calculated t-value of 27.06 which is greater than the tabulated t-value of 1.96 and the p-value of 0.000 which is less than the significant value of 0.05 showed that the coefficient of relationship is significant. The significance value (or p-value) of 0.000 tells us that the probability of getting a correlation coefficient of .806 in a sample of 397 students if the null hypothesis was true (that, there is no significant relationship between internet connectivity and utilization of information resources) is very low or nearly zero. This shows that there is a significant relationship between internet connectivity and utilization of information resources.

Ho_3: There is no significant relationship between institutional repositories and utilization of information resources?

Table 6: Calculated t-value , p-value, Tabulated t-value and Decision on the Relationship between institutional repositories and utilization of information resources.

			nt_{Cal}	$dfp - valuet_{Crit}$	Decision
397	0.62	397	.538	1.96	H_{02} is Accepted

The calculated and tabulated t-values are 0.62 and 1.96 respectively, while the p-value is 0.538. Since the calculated t-value is less than the tabulated t-value and the p-value is greater than the significant value of 0.05, the null hypothesis is accepted. Therefore, the relationship between institutional repositories and utilization of information resources is not significant. The p-value (0.538) tells us that the probability of getting a correlation

coefficient of .031 in a sample of 397 students if the null hypothesis was true (that, there was no relationship between institutional repositories and utilization of information resources) is very high or nearly one. Hence, there is no significant relationship between institutional repositories and utilization of information resources.

DISCUSSION OF FINDINGS

Library Environment and utilization of Information Resources

This study discovered that the relationship between library environment and utilization of information resources is very high, positive and significant. This means that environmental factors such as well-designed building, lighting, ventilation, reading space, conveniences are put in place, there will be effective utilization of the library. This finding is in tandem with that of Echem and Udo-Anyanwu (2018) that a strong, positive and significant relationship exist between the library environment and students' use of the library. It also agree with that of Folorunso and Njoku (2016) that there is a significant relationship between the independent variables (library environment) and the dependent variable (use of library) This finding does not agree with that of Okorie (2018) who discovered that the extent of relationship between the environmental factors and use of library information resources in the federal universities is very low, negative and significant.

INTERNET CONNECTIVITY AND UTILIZATION OF INFORMATION RESOURCES

It was discovered that the relationship between internet connectivity and utilization of information resources is very high and there is a significant relationship between internet connectivity and utilization of information resources. This buttresses the fact that the use of the Internet in the library environment has facilitated easy access to many resources, and significant increase in information utilization. Mostofa (2011) opined that the internet provides a wealth of information in any subject field and students are using the internet increasingly as it occupies an important place among various information sources. The result of Adedokun, Magaji and Makinde(2018) showed no significant relationship between Internet use and library patronage.

INSTITUTIONAL REPOSITORIESAND UTILIZATION OF INFORMATION RESOURCES

The relationship between institutional repositories and utilization of information resources is very low. There is no significant relationship between institutional repositories and utilization of information resources. This finding may be attributed to the fact that the students may not be aware of institutional repositories and hence may not know their benefits. This is because the full benefits of institutional digital repository can be achieved only if stakeholders involved are fully aware of its potential roles. No wonder Iheanacho-Kelechi (2019) in

her study discovered that the institutions studied have little contents in their online repository limited to only technical reports and research articles. Also, Nunda and Elia's(2019) findings indicate low adoption rate of institutional repositories among students.

CONCLUSION

The library users are the major reason for the establishment of university libraries. The utilization of the information resources in various formats contained in the library makes it worthwhile. There are a whole of lot media through which the students can get information. These media compete with the library and if the library management does nothing, it is bound to lose its users. The university libraries therefore need to put every effort to ensure that users are motivated to make effective utilization of information resources. The motivation can come through the library environment, internet connectivity, and the creation of awareness of the existence of institutional repositories.

RECOMMENDATIONS

Based on the findings, the researchers recommend that:

1. Conducive library environment should be provided in the universities for effective function of the libraries and to also ensure the comfort of the library users.
2. The library should be connected to an effective internet service provider. The internet connectivity should be made accessible to the students as far as they are within the school premises.
3. Institutional repositories are store houses of information resources emanating from the university. The university library should create awareness of the existence of institutional repositories so the students can make use of the resources contained therein.

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ECONOMICS OF INFORMATION IN LIS

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Dr. Manoramasrinath[11]

Abstract

The value of any product or service depends on the extent of its use by the customers. The production of Goods or services depends on its demand. So the value of the product or service depends on extent of usage and as well as the demand. Apart from this the monitory value of product as service plans a crucial role in the overall profit or loss. This is the general theory for any commercial production service. But as far as the libraries are concern being an nonprofit organisation the value derived by using the resources or the services of the library cannot be measured in terms of monitory value. Unless a resource or service is measured in terms of monitory value one cannot estimate the benefit of the cost spent for providing the services to the users because the cost of buying the resources and producing the services involvers monitory value which is in quantitative terms whereas the benefits derived by the resources and the services can be measured only in a qualitative terms such as satisfactory, not satisfactory, good or bad etc., but this qualitative terms without indicate whether the money spent on buying the resources and providing the services are worth or not. Generally, most of the time the libraries face financial crunch and the finance allocated to the library has to be spent very carefully. Moreover, if the benefits of the library are registered in terms of monitory value its will definitely help to prevent the financial shortage and opt for more financial assistance to improve the library. Hence in this article an attempt is made to describe the qualitative benefits of using the resources and the services of the library into a quantitative value of money or monitory value. This will give a clear idea of to what extent the capital invested in the library is spent efficiently.

Keywords: Cost-benefit analysis model, Production and designing of information, Marketing strategy, Kotler's four Cs, McCarthy's four Ps etc.

INTRODUCTION

Economics of information has been drawing significant attention among library professionals for the past few years. But the Economics information and the Economics of goods and services are different from Economics of information. Information Economics has resulted from intellectual revolution. Though information has recognized as a saleable commodity, it is fundamentally different from other commodities. The value of

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information mainly depends on the user's perception about the information. The same information might have different value for different people in different times. The value of information is directly proportionate to the time and its relevance, which should exactly match with the purpose.

The value and use of libraries have gone down to a considerable extent by the advent of Internet which has drawn most of the library users. This situation has been further augmented by the publishers of periodicals who are taking advantage in the pretext of resource sharing and consortium. The theory of survival of the fittest has become a reality among the libraries. It is high time to give a wakeup call for the library professionals and analyze the situation in a more concrete way and completely revamp the existing situation.

DESIGNING INFORMATION PRODUCTS

Enhanced information products to suit the specific need of a particular group of target users will have more value and command price premiums over comparable products with low intensity of information. Hence generating enhanced information products, which will be more personalized for the users will be a better approach rather than wasting the limited finance in the libraries by purchasing the low value yielding information sources. Designing value –oriented and tailor-made information products will not only enhance the prestige of the library but it will also fetch a considerable amount of revenue to the library.

SELLING INFORMATION PRODUCT FOR A COST

Buying information for a cost is not new to the users and the concept of selling information has been gradually introduced in the libraries by collecting service charges for document duplication, downloading information from Internet and international databases. If the library professionals could draw their attention to this situation and realize the significance of this phenomenon, selling an SPIP (Selective Personalized Information Product) for a cost in a library may not be very far off.

DESIGNING INFORMATION PRODUCTS

The product to be designed should not be a duplicate of any other commercial product, but it should be a unique one which could be really worth to be `sold' to the users. It should be more than just a database, and the content of the product may provide information to take decision or solve a problem. This venture demands training of the library professional to acquire skills of designing decision support aids, which is another dimension of designing an SPIP. Now this paper concentrates only on Economics of information which involves the process of determining the cost of the information product to be designed by the library professionals. Determining the cost of an information product depends heavily on various factors which have needs careful analysis.

There are number of cost benefit analysis models to assess the value of library resources. But these models will help to determine the value only in an indirect way by finding the benefit derived by the user in terms of the cost of the information source or journals, where the benefit is a qualitative aspect and cost is the quantitative aspect. Comparing quality and quantity will not yield proper results.

FIXED AND VARIABLE COST

The cost of an output can be grouped under fixed and variable cost. Fixed cost remains the same, within a period of time, regardless of the level of out put. In publishing fixed cost may be referred as the cost of the first copy. Variable cost will increase as the copies are increased within a given period of time. In publishing a document or journal, the variable cost includes the cost of the paper, printing cost, and marketing. If the production of the document is increased over a period the variable cost will be increased. It should be noted that the cost of producing a research article involves fixed cost of conducting experiments or survey etc.,.

MARGINAL AVERAGE AND TOTAL COST

The marginal cost is the cost that results from increasing the output by one unit. The average cost of one unit is the total cost divided by the number of units

The above description presents an account of production cost of information. In a library the production cost of documents purchased are not applicable. Librarians are generally concerned with the financial resources allocated for them to purchase the resources. But the library professionals can try to analyze the benefit derived by the users by reading the document.

Cost-benefit analysis model

The general cost-benefit analysis model of documents depends on the association of number of times a piece of information has been utilized by the user. When a group of journal titles are identified as most demanded ones and has been utilized to the maximum extent, than those journals help to determine the cut of point, for the selection of periodical titles. This helps the cost-benefit utilization of financial resources. But this approach will not help to determine the exact value of the information in user point of view. Hence the value of a piece of information must be determined on the basis of user satisfaction

THE RATIO OF THE COST OF THE BOOK TO THAT OF UTILITY VALUE

The ratio of the cost of the book to that of utility value could be derived by using the following formula:-

Total number of students x

Number of Unsatisfied students =y

Number of Satisfied students = ss = (x-y)

Cost of n number of books =cp

Percentage of satisfaction =ps

Value of Utility =u

u=ps×cp /(x-y)

Ratio = r = cp/u

The ratio between the n numbers of cost of the books is to that of utility value.

Example

For example twenty five students got five books and among them, only ten students found that those books covered only 50% of their information requirements. The average cost of the five books constitute rupees two hundred and fifty. To find the ratio between the total cost of the books to that of utility value, the above formula can be applied in the following manner.

x=25 y=15

ss = (x-y) = 25-15=10

n=5; average cost of books = a= Rs.250

cp =n× a

cp =5 × 250 = Rs. 1250

ps=50%

Value of utility = u= ps×cp /(x-y)

50% × 1250/10

Ratio = cp/u

u = 50 /100 × 1250/ (25-15) = 62.50

u =Rs 62.50

r = cp/u= 1250/62.50

Percentage value = (1250/62.50) × 1/100 = 5%

The above calculation indicates that the library has spent an average of Rs 250 per book. Therefore the total cost of five books is rupees 1250. But the utility value is found to be Rs. 62.50 only. Therefore the percentage of 'value of utility' is 5 only.

LIMITATION OF THE CALCULATION

The above calculation has a limitation, because it has not taken into account of the time and energy spent by the user for searching information, locating it, and to match the content of the document with the exact information requirement. Hence the value of the information should be determined by calculating the retrieval cost which is based on the time taken by the user to search, locate and to find out whether the content of the document matches with his/her exact requirement. To calculate the retrieval cost a simple formula could be used.

FORMULA TO MEASURE THE RETRIEVAL COST OF A RELEVANT DOCUMENT

Retrieval cost of the document = Retrieval time X earning capacity of the user

Retrieval time = rt = st +lt +mt

Searching time =st

Document locating time= lt

Matching the requirement with the content =mt

Earning capacity of the user = ec

Retrieval cost = rc = rt Xec

For example

A person salary for one month is Rs 32000

Per day (for 8 hours)1066

For one minute Rs 2.22

Ec= Earningcapacity per minute Rs 2.22

Ec=2.22

Searching time 30 min

Locating time the document 10 min

Matching the content 5min

Retrieval time= rt = 30+10+5=45 min

Retrieval cost =rc = 2.22 X 45 = 99.90

The real value of information = rvi=r+rc

For example if r= Rs 62, than rvi = 62 + 99.90 = 161.90

The retrieval cost could be reduced by the appropriate technology. If the cost of the earning capacity is high the cost of investment will be worth. In other words if the earning capacity of the user is high it will be multiplied by the retrieval time which will increase the retrieval cost. Since the controllable variable is the retrieval time which could be reduced by implementing sophisticated technology. If the earning capacity of the user is high, it is worth spending on technology which will be appreciated by the users. The implementation of effective retrieval system will reduce the retrieval time which has an impact on retrieval cost since the retrieval time will be multiplied with the earning capacity of the user. For example if the retrieval time is 15 minutes instead of 45 minutes and if it is multiplied with 2.22 (which is the earning capacity of the user) , than 15 X 2.22 = 33.3. Hence judging the exact value of information depends on the utility value and the retrieval cost of information.

PRODUCTION AND DESIGNING OF INFORMATION

There is a clear distinction between production of document and designing a product. In the context of information sources `production' refers to the mass production of documents which is aimed at general group of users. To satisfy the needs of specific, target group of users, information` product' has to be designed. If the user is not aware of his specific need than `production' will suit him Here the production is the stock of the library. If the user is aware of his information requirement which he wants for a specific purpose than a designed `product' will suit him. For such users the library should design the `product' for a price.

DESIGNING AN INFORMATION PRODUCT

A survey of the exact requirements of the target group of users is an essential pre-requisite for designing information products. The segmentation should be generally based on the organizational affiliation of the users. The requirements of business and industrial personnel will be decision oriented, which will differ from the requirements of the academic institutions. For example a database of knowledge assets of an organization or a decision support system will enhance the business intelligence. A portal with many links for rich information sources or a trend report on various disciplines will be immensely useful for research scholars for whom the products should support their teaching and research activities.

INTELLECTUAL PROPERTY RIGHTS

While designing a product one should take care of the intellectual property right. Copy right act provides protection for thirty two years for a document but by that time there is a possibility of it becoming obsolete. But if an information product is designed by gathering information for various sources than it does not involve copy right violation.

QUALITY

Value of the product not only depends on relevance but also on the quality. The value goes up if the quality of the product is high. Quality of the product must be maintained by identifying the defects and rectifying them before marketing them. For information products, particularly in Science and Technology the life cycle is quite short when compared to Social Science and Humanities. Hence for such products the point of obsolesce should be carefully monitored and lifted up

INFORMATION OVERLOAD

Information economy differs from traditional economy in the sense that there is no scarcity of information but available in abundance. The advent of Internet has brought in a new problem of information overload. Unlike most resources that deplete when used, information can grow through application.

In the context of Economics, elasticity of the price depends on supply and demand. But this general theory will not be applicable to the marketing of information. Though information is available in abundance, the relevant information is scare, which creates the demand. If the relevance is increased the value of the information goes up, and the price could be increased. Hence the elasticity of the price of the information depends on the `relevance and demand'.

COMPETITIVE SITUATION

Information market structure is highly competitive and turbulent.

Publishing industry is facing a tough competition, which has been accentuated by the shrinking funds of the library and the escalation of cost of periodicals. It is also believed that Internet and TV are powerful means which generally tend to reduce the reading time of the society.

MARKETING STRATEGY

The major aim of the marketing strategy is to promote the sales. In libraries the market strategy is different from marketing strategy of commercial goods. The marketing strategy depends mainly on two factors namely stock and flow. In libraries the library books are the `stock' and the specific information products are concerned with market `flow'. The value of the library resources does not depend on the `stock' but in the `flow'.

FACTORS TO BE CONSIDERED IN MARKETING

Kotler's four Cs

In the context of determining cost for information product one can examine to what extent the traditional marketing mix is applicable. Jerome McCarthy's four Ps is widely known as Product, Price, Place and Promotion which are generally recognized as a seller's paradigm. But Kotler's four C's will be more acceptable for libraries. The four C's are Customer value, Cost to the customer, customer Convenience and Communication, which are buyer's paradigm.

The information product or service produced by the library should be valuable to the client, which will be on the basis of the right information to the right reader. Similarly, while fixing the cost for the product it should be considered whether the user could afford the cost. The place where the information is available should be most convenient for the user. Making the product available in a network environment will satisfy the third `C' of Kotler. The fourth `C' of Kotler (communication) depends on the promotion policy of the library and a very effective public relation practice should be maintained by the library staff. The promotion policy should highlight all possibilities of adopting an effective communication pattern and motivate the library staff to develop the traits of salesmanship which should be supported by appropriate infrastructure facilities. The promotional activity should not be just limited at attracting and retaining the existing users but it should also draw the users from other commercial competitors.

CONCLUSION

The information professionals must realize that their role is now becoming multidimensional and their sustainability depends on their capability to adjust to the paradigm shift in the profession The intellectual needs of the of the target group of users have been gradually becoming complicated which has to be well understood by the professionals and they should know the methodology of striking a balance between the expectations of the users and the limitations of the organization in which they are working. For this, re-engineering of traditional methods, which are less effective should be done by adopting modern management techniques such as Total Quality Management, marketing management and knowledge management should be adopted. The present knowledge society needs highly skilled knowledge managers rather than traditional librarians who can manage knowledge assets of any organization and contribute their share for globalization which has a significant role in enhancing the economy of the nation.

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IMPACT OF BLOCKCHAIN TECHNOLOGY ON HUMAN RESOURCE PRACTICES OF AN ORGANIZATION

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Abstract

Globalization brings in broader opportunities for the organizations to adopt newer technologies to be competitive in the market. Human resources (HR) do operation of connecting with the Global talents and they act as the face of the organization to the outside world. Any error or delay in their process creates adverse effect. The emergence of Blockchain technology and its use on crypto assets has helped it to grow in a staggering 50% when compared to 2020 and is expected to grow at a CAGR pf 67%. IT sector have started adopting the Blockchain technology on their Organizational process. The purpose of this study is to understand the concept of Blockchain and its implementation in day-today organization. The study made an attempt to give solution on managing some of the core HR process with the integration of Blockchain.

Keywords: Blockchain Technology, HR Process, Skill mapping, Crypto assets

INTRODUCTION

A Blockchain is a digital or virtual ledger that records transactions based on information in way that makes it hard to hack or change the data it has. Blockchain technology allows the person to do the transaction directly with each other. Blockchain technology will completely renovate the traditional firm systems, thus enable its application on various areas and sectors (Wang et al., 2017). Some of the Big companies identified the use of blockchain technology and have started adopting it in their companies like Microsoft, Starbucks, Paypal, NVIDA, SQUARE and more. There is an increased pressure forced on organizations to integrate technology into entire business areas to deliver more value to their clients (Papadopoulos et al., 2020) Human Resource is a department where many transactions get recorded in a day and this involves more important jobs like Skill mapping, Payroll processing etc. This Paper has made an attempt to identify those areas where the Blockchain technology can be implemented in HRM and HR's View and their readiness to adopt Blockchain technology.

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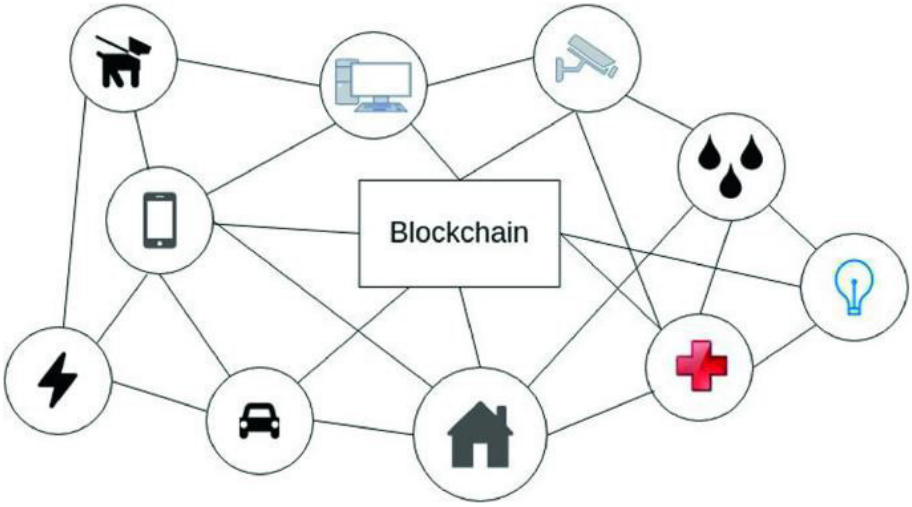
LITERATURE REVIEW

The developments happened in blockchain technology continue to impress leaders across industries with data security and data integrity features (Dunham 2017). Blockchain is a shared, decentralized, distributed ledger, non-Modifiable which facilitates recording of transactions and tracking assets in a business network (PwC 2017a; Gupta, 2017; Hsiao et al., 2018). Blockchain technology has evidenced to be a disruptive technology that attracts attention of not only researchers and practitioners, but business organizations as well (Hughes et al., 2019). HR Professionals play a main role in providing consultancy to the organization as a "change transformation agent" and associates of its leadership make actual behavioral alterations influencing organizational efficiency (Deshler, 2016). Blockchain can identify potential hazards and can be used in handling information collection and information. An instance is using a blockchain ledger since it is a reliable instrument for verifying the history of the applicants (Aishwarya, 2018).

Fig 1: Pictoral Representation of Blockchain Operation



KEY ELEMENTS OF BLOCKCHAIN

1. Distributed Ledger Technology: All the participants in the network have access to the distributed ledger and its transaction records. With this shared ledger, Duplication of transaction can be eliminated.
2. Immutable Records: Even though all the participants in the network have access to the ledger, no changes or deletions can be made once the information is recorded. If error occurs, a new transaction has to be made to reverse the error.
3. Smart Contracts: To enhance the speed of the transaction, set of rules called a smart contract is stored in the blockchain and will be executed automatically. A smart contract can define conditions for corporate bond transactions.

Benefits

1. Security: Data Security is maintained as consensus from the parties in the network required for all the transactions. The information is recorded permanently. Not even the System administrator has access to delete the information.
2. More Efficiency: Most of the operations waste effort on duplicating the record keeping and third-party data transactions. With DL (Distributed Ledger) time wasting record will be removed

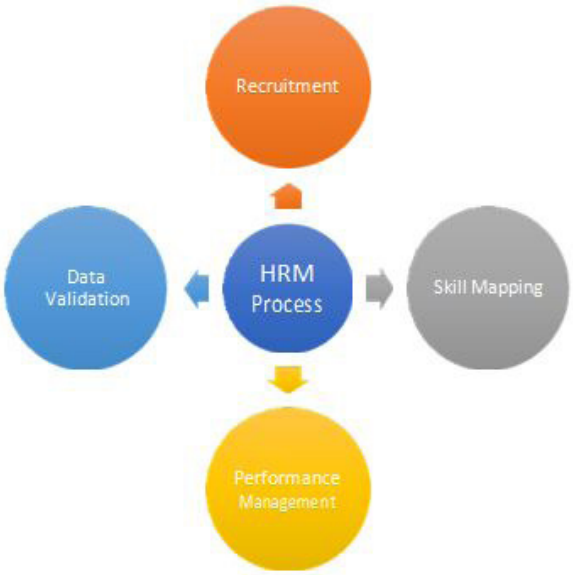
HR Process

Human Resource Department is like heart of an organization. More documentary works and transaction happens in this department, right from hiring the employee to monitoring the employee HRM performs various functions. Most of the big companies have adopted specific software like SAP, Workday etc. for recording the HR process and which has resulted in higher efficiency and time reduction

Some of the major HRM Process considered in this paper are:

1. Data Validation: Candidate's genuineness is verified in this process. Before becoming an employee in the organization, the candidate's certificates like academic and non- academic qualifications will be verified. This step takes most chunk of the time in HR process.
2. Skill Mapping: Skill Mapping is the most critical and important part of HR process. This involves matching the candidate's skill with organization or projects skill requirement, If the skill mismatch happens total work system collapses as the employee may not be able to understand what is required out of him.
3. Recruitment: Recruitment involves with hiring the potential candidates to the organization. It has many processes starting with preparing Job Description to Induction.
4. Performance Management: Managing the Employee's performance against his KPP (Key Performance Parameter) has to be done every year and promotion or salary hikes are given based o the performance against his target.

Fig 2: Process of HR in an Organisation



BLOCKCHAIN BASED RECRUITMENT

Recruitment involves screening the candidates, collecting references, scheduling interviews, conducting background checks and so on. These tasks are repetitive and using blockchain these repeated tasks can be automated. Automated Referencing, Assessment Tools and Feedback tool from technical interview pane allows recruiters to collect information within seconds. Blockchain technology can be used to produce a chain of personal records and information when applying for jobs. When screening candidates, recruiters can easily access an individual's public blockchain for past work experience, contact information and other personal data required throughout the process. This use of blockchain technology will definitely expand the candidate experience, allowing job seekers to create a particular account of their experience and information that could be used across all job applications.

This verifiable chain of data would also help in eliminating the time and concerns associated with manually sourcing this information resulting in optimized costs and vigorous recruitment. There are many benefits which blockchain recruitment could enjoy.

- Biometric ID verification will authorize validity of candidates
- Generalized or Standardized resumes will ensure quality of CV content over its layout
- QR Codes on every candidate profile help in recording and tracking their professional development and add it straight into their profile
- There will be lesser referencing requirement which infers that whole recruitment process and on-boarding process will be faster and cheaper.
- It will be GDPR (General Data Protection Regulation)-compliant. While information on the Blockchain cannot be deleted, the platform will be able to retract candidate data.

- It will ensure security since it is on the blockchain, the information is secure and it cannot be changed or altered. At no point the system can fail or be compromised.

DATA VALIDATION USING BLOCKCHAIN

Due to large number of applicants, Bigger Organizations sign third-party contracts for verification services. Smaller organizations spend more time by verifying the candidature on their own. Distribute Ledger (DL) Technology will help the HR Professionals for certificate validation. Blockchain technology is still very early in some industries but it is the most secure data record to verify a potential candidate's education and work experience. The accurate data which staffing agencies can retrieve from candidates, the candidate can be matched to the right jobs. Most importantly, storing the information and actually placing ownership in the hands of the employee always has a chance to minimize the risks data-privacy regulations.

SKILL MAPPING – USING BLOCKCHAIN

Mapping the candidate's skill with the exact requirement is a big task for HR as it involves specific technology which only technical experts are aware. Blockchain has a potential to track everything from where it originated. Internet of Things (IOT) is a combination of software and network that enables the exchange of data between the objects. The application of blockchain makes historical readings nearly impossible to interfere with. Another Advantage of Blockchain is that, it can be used for spatial verification it can track people where they are and when they made transaction. In the same way, the implementation of blockchain technology allows HR leaders to understand their employees' skills, strengths and access to their learning records. It also helps them to view the skills of all the potential candidates who have shared their details, thus enabling the HR leaders to understand their employee's skills, strengths and access to their learning records. It also helps them to vies the skills of all the potential candidates who have shared their details, this enabling the HR leaders to be prepared for the future (PwC, 2015). Transition validity (retaining the records by major nodes) feature of the blockchain will help to positively influence HR professionals in the adoption of effective skill mapping.

BLOCKCHAIN INTEGRATED PERFORMANCE MANAGEMENT

Performance Management is an important record keeping activity and should be implemented as a private ledger. Every year a block is created with the current year goals, targets accepted with all required measures, this block can be accessed by all the members in the organization it adds feedback and give appreciation or suggest for areas of improvement. When an assignment is allocated, corresponding manager can add a block which can be validated by the line manage. When the assignment is completed, the assignee will provide feedback for that block. If there is any deviation, the validation process will prompt the same. At the end of the year, all blocks would have validated and the block can be seen by everyone. This reduces and new documentation and by analyzing various blocks true feedback can be given to the employee. This will

definitely provide a greater employee experience as there is transparency in the process and possibility of reduced bias or subjectivity. Final feedback can also be recorded in the same blockchain which again can be validated.

DATA ANALYSIS

As per the above study, 4 factors were considered to know the opinion or view of HR on Blockchain technology. Chi Square Test was conducted to find the significant difference between the view on blockchain and traditional HR Practices.

1. Data Validation
2. Recruitment
3. Skill Mapping
4. Performance Management

NULL HYPOTHESES

H0: There is no significant difference between HR view on using Blockchain technology and traditional HR practice on Data Validation

H1: There is no significant difference between HR view on using Blockchain technology and traditional HR practice on Recruitment

H2: There is no significant difference between HR View on using Blockchain technology and traditional HR practice on Skill Mapping

H3: There is no significant difference between HR View on using Blockchain technology and traditional HR practice on Performance Management

RESEARCH DESIGN AND SAMPLING METHOD USED

Total Samples Collected 148

Respondents Average Age 34

Average Career Level of Employees: Manager

Main Focus area of Questionnaire: Awareness of Blockchain Technology and its Application in current HR practices

Sampling Method: Snowball sampling

Table 1: Respondent Statistics

Research Results:

Blockchain Technology vs HR Traditonal practices on Data validation

Variable	Blockchain	HR Traditional Practices	Can't Say
Verifying the Academic Qualification or data of employees	70.9 %	25.3%	3,8%
Getting the Employees previous employee Data and skill certificates	79%	13.4%	7.6%
Data validation Access and Sharing the information	69.3%	22.8%	7.9%
Cost Saving	82.1%	15.4%	2.5%
Data Security	73.2%	24.2%	2.6%

Table 2: Data Validation Response

Result Inference

Chi Square Test was conducted at significance value of 0.05 and the chi square statistic value is 20.291. The p-value is 0.009289. Since p<0.0f, alternate hypothesis is accepted. There is significant difference between the opinion of HR's on Blockchain vs HR Traditional Practices on Data Validation.

Blockchain Technology vs HR Traditional practices on Skill Mapping:

Variable	Blockchain	HR Traditional Practices	Can't Say
Understandability of Skill	66.9%	28.3%	4.8%
Speed	51.3%	42.6%	6.1%
Easy to Plan on L&D Strategies	58.1%	37.5%	4.4%
Cost	34.3%	52.3%	13.4%
Identification of sub skill over core skill during mapping	72.4%	22.2%	5.4%

Table 3: Skill Mapping Response

Result Inference

Chi Square Test was conducted at significance value of 0.05 and the Chi square statistic value is 1.638. The p-value is 0.423. Since p>0.05, Null Hypotheses is accepted. There is no significant difference between the opinion of HR's on Blockchain vs HR Traditional Practices on Skill Mapping

Blockchain Technology vs HR Traditional practices on Recruitment:

Variable	Blockchain	HR Traditional Practices	Can't Say
Ease of sourcing the candidate profile	43.3%	44.2%	2.5%
Cost	74.3%	22%	2.7%
Third Party dependency	59.8%	27.7%	12.5%
Background Verification	55.6%	21.1%	23.3%
Speed	61.4%	32.9%	6.7%

Result Inference

Chi Square Test was conducted at significance value of 0.05 and the Chi Square Statistic value is 10.08. The p-value is 0.0067. Since p<0.05, Alternate Hypotheses is accepted. There is significant difference between the opinion of HR's on Blockchain vs HR Traditional Practices on Performance Management.

DISCUSSION & FINDINGS

From the total 148 Samples collected form HR's form different IT organizations. Their view on the 4 factors were analyzed which includes (Skill Mapping, Recruitment, Data Validation and Performance Management). The above factors are compared in terms of HR's view on Blockchain integrated HR practices over Traditional HR Practices. From the inferences, it is found that except for Skill Mapping, all the other 3 factors had significant differences from which we can conclude that on successful implementation of Blockchain technology in HRM Practices. The companies can take advantage on its competition with other companies by enjoying the benefits of blockchain.

CONCLUSION

According to a survey conducted by Deloitte on 2019, 53% of the companies say that Blockchain Technology has become a priority for their organization, which is 10 percent higher that previous year. Digital Assets like Bitcoin have also started gaining traction as the investors have started investing in cryptos which also makes Blockchain technology more important as the Crypto assets are stored in Blockchain. Paper works and repeated tasks in HR Department are higher hence many companies are using many software to enhance the speed and accuracy of the department so that they can keep their workforce happy, Blockchain is one such technology which addresses all the problems like speed, accuracy, security etc. Even though, Blockchain has many advantages over other technologies, it has certain challenges which needs to be addressed. The foremost challenge will be regulatory, who will regulate this Blockchain as of now there is no regulation. Very High Energy Consumption, which lead to ban of Crypto assets in countries like China. Lack of adequate skillsets for the current workforce, Blockchain is still new and individuals must go through lot of training before working into it and the trainers available are very less. These challenges have to be overcome by Blockchain companies to make it strong future technology not only in HR but also in every part of the organization. Blockchain will definitely become an integrated tool in the organization which is very imminent in short duration.

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POSITION OF LIBRARIAN ON THE SUSTAINABLE DEVELOPMENT DISCOURSE

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Abstract

The necessity for libraries and librarians is to ensure that when knowledge is sought for, it is provided and gotten with understanding thereafter. As librarians help to explore and rethink the causes of information gaps and ways to fill these gaps, they are also making libraries serve as exemplary learning and research hubs which global agenda such as the sustainable development try to promote and bind. Position of the librarian on the sustainable development discourse is very important in terms of roles which enable them to campaign, provide content and context from diverse literature and guided themes that reiterate the significance of the continuity of life, the environment at extremely insignificance danger as well as with empirical accounts to be able to address failed paths towards the implementation of the sustainable development. The paper provide insights on the roles librarians play in the sustainable development value chain. It was concluded that it is not sufficient to base sustainable development on economic, environmental and social elements without recourse to librarians' supportwhenever the intent is to avert retardation to the globalize implementation of the sustainable development agenda.

Keywords: Librarian, sustainable development, collaboration, information need, embedded librarianship

INTRODUCTION

The librarian has severally been conceived as a professional from both subjective and objective role approaches. These nevertheless does not change the position of the librarian as an educator nor information practicing professional who has undergone formal training and administered both hard and soft skills to guide, harness, and support the conduct of information seeking, evaluate the attributes of information resources and their sources as well as information couriers and their formats. In addition, librarians curate from the diverse

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resources before organizing them for both academic and non-academic uses to add values that influence decision making, policy creation and knowledge growth.

In specific terms, as educators, librarians provide the instructional training required through the years of studies (schooling) to articulate solutions to challenges caused by dearth of information. Such trainings provided by librarians integrate what theory and curriculum preferred as solutions to the relationship between the "academic and community it serves". At this level, information acquisition, classification tools, organization, and information behavioural patterns, internal and external are synchronized. During synchronization, the librarian avail all patrons resources that help with the articulation and syntheses of the different logical and sensible techniques that can be usethroughout the purpose for which information is needed.

As practicing librarian, the institution served benefits from support and facilitation from the services provided. The practice also never limits librarians to statutory acquire the requisite information resource, arrange the resources, organize, classify them and sustain all instructional programmesthat focuses on literacy. The practicing library serve stakeholders irrespective of their fields of specialization and endeavours at all times to include them in the development processes such thelibrary collections development and policy implementations. The objective of the inclusion include to make good use of the resources, understandably because those served are aware and services they can obtain are not strange because they are part and parcel of all the build -up.

From the two positions that tried to describe the librarian – as an educator or practicing professional; the attributes have shown them to be of great expectations from themselves and the people they serve. As dependable allies in the knowledge-base, curators, content development, instructors, and facilitators librarians arguably should not be taken for granted particularly on the discourse of sustainable development which hinge on the contributory roles of everyone whose focus is on collective good of the current and future generations. Understandably, that the position of the librarian is basically to continuously lead to where the needed information can be access, retrieved and used to provide knowledge and all the informed decisions on sustainable development.

The historical antecedent about sustainable development globally began with the Brundland Report which called for the end of wrong use of tangible and intangible resources so that the course to sustainability is not negated. The negative changes that neglecting the call can amount to can only be imagined. The devastations of global warming, climate change, ocean rise and draught are typical examples. What the Brudland Report suggested included shared global responsibility, catering for well-being of the natural environment and appropriating measures that protect and nourish resources for the use of future generations and adding to the quality of life to the current generations (Thorpe, 2015, Dang, 2016, Harris, 2000).

Noteworthy and call for the position of the librarian at this perturbing period is premised on the fact that the Agenda 21 of the United Nations is non-binding on nations and professionals, but the sustainable development agenda is binding, have a global appeal and heavily inclusive. Therefore, for librarians this is an opportunity to make the records straight from retrospection - the perspective of reliance on information resources use and the implications of its non-use. Drawing from the understanding that the proliferation of information resources have not been factors as a major challenge, the challenge has been of dearth or information and responsive partnership so that collectively awarenesscan be made locale and the extent implementation can

also be locale as it transits to nationally and globally.

The positions of librarians towards the support to actualize the sustainable development agenda will depend on effectively and efficiently performing their statutory roles in the public, academic, ministries, technical, and communities engagements of providing information and support. For instance, in public libraries, academic and school libraries, librarians serving there can help provide a trajectory growth of resources on sustainable consumption, in some instance provide specific text and resources that address the challenge of sustainable development elements. The fact that the role of the librarian is also globalized, virtual and guided by best acclaimed practices showed that their roles are procedural and standardized. The characteristics of the librarian is both traditional and modern in perspectives and outreach, thereby qualifying the librarian to vent voice on global agenda such as the sustainable development discourse.

The librarian should in the course of making submission be aware that roles are not exhaustive even when their contributions bring positive changes and narrates substantially events that transpired from 1987 when Brundland Report was released on the need for sustainable development. Like Brundland, the librarian is aware of the consequences of negative neglect and eventually what it could cause the environment, economic and social fabrics of the global communities. The paper is scoped to only three themes so that further discourses can be aroused on sustainable development. The three themes comprised; i)Librarians as collaborators for the advancement of sustainable development, ii)Librarians in the information need maze for sustainable development, and iii)Embedded librarianship in the discourse on sustainable development.

LIBRARIANS AS COLLABORATORS FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT

As librarians continue to preserve and conserve information on sustainable development because of their statutory roles as information bridge, and professionals that can be relied on beyond mere news headlines and speculations, collaboration as their attributes occurs naturally (Kasa, Quadir&Bana, 2015). Collaborating with librarians happens at the customer service desk and reference service desk which nevertheless have evolved into more conference, seminars and workshops organized with themes focusing on providing obscure research output that impact and point deliberately to needs of information to contextualize and frame appropriate content devoid of ambiguities.

Incidentally, librarians engage diverse stakeholders who in the course of seeking for information develop confidence and free to contact the librarian to provide resources with empirical viewpoints as well as literature and areas for the replication of results while also making the visibility of contents and contextual attributes of curated topical issues. Collaborating with librarians guarantee numerous benefits at the local, national and global level as they serve as brand ambassadors.

LIBRARIANS IN THE INFORMATION NEED MAZE FOR SUSTAINABLE DEVELOPMENT

The position of the librarian in the information need maze was adequately described by Harris (2000) who reiterated the basic principles of sustainable development that encompassed the functions of the librarians as professionals who always insist and promote ideas that eventually affect millions of people practically. They ensure that access to all types of information is not compromise at the same time help to evaluate the found information into a "best-fit" schema that is not just for the elite.

Kasa, Quadir and Bana (2015) posited that the role of librarians to sustainable development is not contestable considering the ways librarians naturally influence institutional actions that is particular about curriculum, accreditations and promotion of the visibility of research output (local contents). Though libraries differ by the technique and methods use, what unify them all is the consistent to supply the right collections towards satisfying information needs for academic, research growth and community development as well as sustaining the teaching and learning arms. Therefore, the position of librarian in the information need maze include to make the libraries serve as transit of sustainable consumption from local to global hubs; use of numerous platforms to disseminate the right information at the right time, place and for the right purposes irrespective of social media support platform such as Facebook, LinkedIn, Twitter, etc (Kumarjit, 2014).

EMBEDDED LIBRARIANSHIP IN THE DISCOURSE ON SUSTAINABLE DEVELOPMENT

A librarian naturally takes an embedded position which is of mediation. These roles starts from encouraging stakeholders to appreciate originality of thoughts, converging such thoughts with past thrust and usurping such thought with anticipated future outcome that make the efforts continuum.As a professional, the embedded librarian possess the instinct of a would be research report and capable to instruct on the appropriate sequence which the building blocks could make ideas comprehensive. The support of the librarians surged through gained working experience, literally exposures and instructional skills placed them on pedestals to offer their opinions within the acceptable research and scholarly ethical norms.

These attributes to a large extent exposed that the call towards sustainable development goes beyond just advocacy to integration of already dispersed research output and the collations of facts that promote sustainable consumption of those ascribed facts to address both the literature and empirical gaps. Awareness and collective bargaining can be converge to proffer implementable resolutions instantly.

CONCLUSION

Basing sustainable development mainly on economics, environmental and social elements have been found to be inconclusive particularly when the people are ignorant of the diverse perspectives already shared and

communicated. There is no doubt that without the librarian's performing their statutory roles as professionals that disseminate outcomes, synthesise and make visible the articulated submissions on sustainable development many will be languishing because of dearth of knowledge, that eventually be threat to the implementation of the sustainable development agenda fully. Librarians' position should be deliberate in order for the discourse to be expanded to include feedback from the diverse domains where the librarians serve and a major ecosystem that must be sustained for posterity sake.

WAYS FORWARD

Librarians in schools, public and academic libraries are frontline workers on any global issue and can gather intelligent response through her operating desks to support quality education and attract audiences that can get committed. As the libraries through the librarians provide access to print, electronic, subscribed, open sources and archival resources, it attest that by no means should the librarian undermine making substantial contributions using the library service desk to provide particularly curated information that buttresses the sustainability in sustainable development.

As long as the librarian is concern, salvaging person from ignorance (required information), filling gaps and exposing people to required tasks towards sustainable consumptioncan solve the challenges of subjective risk which sustainable development is so subjective about. Librarians should anchor the instructed space to interface information seeks and make the communities they serve recognise the magnitude of neglecting their immediate ecosystems which will cause globalisation to fail.

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APPLICATION OF SOCIAL NETWORK ANALYSIS TO METRIC STUDIES: A METHODOLOGICAL FRAMEWORK

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Abstract

This article proposed a methodological framework for applying Social Network Analysis (SNA) to the metric studies (bibliometric and scientometrics). This study focus on the most commonly used indicators of SNA to the co authorship network. It also validates the hypotheses that most prolific authors play key roles in the co authorship network as a most influential, intermediary and productive authors; the centrality ranking of researcher greatly influence the research performance.It also compares the productivity of the authors with SNA measures which offers more insights about the centrality measures.

Keywords: Social Network Analysis;; Centrality Measures; Co authorship Network; Scientometrics

INTRODUCTION

Science and technology have a significant impact on humankind that provides scientific knowledge for physical, mental, and social wellbeing that also perform varieties of functions for the benefits of society. The scientific expertise further creates more new knowledge; innovations that involve economies of expenditures incurred for research capacity building, and R&D centers. Human resources have high impact on the socio-economics of the country. Thus the economic profitability of scientific activities originates from the need to measure the science quantitatively. The quantitative measurements are concerned about economic aspects, knowledge, and scientific productivity in terms of publications (Tijssen, 1992). The quantitative analysis of scientific publications is popularly known as Bibliometric or Scientometrics

The scientometrics indicators are used to evaluate the published scientific literature in any given field of study. The indicators are approached from three-level micro, meso, and macro, micro-works with individuals, meso at an organization or institutional, and macro at countries level studies the countries' world share of scientific publication in any particular field over a specific period can be aggregated at different levels.

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With the advent of science and technologies, enormous numbers of bibliometric and scientometrics measures/indicators proponed to study the present state of science assist stakeholders, administrators, and policymakers in decision making, formulating strategic planning, policies, and setting research priorities. However, the scientometrics indicators alone insufficient; it can be used along with other indicators.

During the twentieth century, the mapping of science slowly adopted network analysis, which significantly analyzes the cohesive structure of collaborators, identifies research communities or invisible elite groups, and studies the intellectual structure of any given subject. The availability of large datasets and software programs made it possible to construct networks for any bibliographical entities (author, citation, keywords, and journal) as a unit of analysis to study collaborative pattern and their implications in terms of network theory. Thus SNA measures are also used in the study of science and technology to illuminates the social structure of the authors, organizations, countries, and conceptual structures of the field. SNA predominantly helps the administrators, policymakers to identify the core authors/research teams, and their linkages, detecting research hotspots and weaknesses, the knowledge diffusion pattern, and dynamics of science. SNA is becoming a powerful technique in research management and science policy.

The SNA has evolved as a technique from the discipline of sociology. It has grown significantly in anthropology, biology, social psychology, information science, communication science, physics, and economics, with different applications formed as a multi-interdisciplinary subject. The SNA mainly focuses on the relationships among the social entities represented by actors, organizations, families, communities, nations, and others. The SNA provides a methodology to analyze social and conceptual relations of entities and facilitates visualization of those relations in terms of networks to identify and interpret the pattern of relationships among them.

Research in many academic fields (Brughmans, 2013; Giannakis, 2012; Newman, 2001) shown that SNA functions can be approached from different aggregate levels from individual to international. SNA functions play an essential role in identifying research specialties, flow of knowledge, and analyze social structures of the collaborators, understanding the role, position of individuals in the social structures. SNA enables evaluation of the research performance of an individual/institution/nation and provides essential information to support the policymakers in understanding the landscapes of the subject, research fronts, and developing a strategy for policy planning (Morel et al., 2009).

Therefore methodological framework has been proposed in this article to apply SNA measures to the metric studies as gap in the literature identified in this perspective. The main objective of this study is to provide a methodological framework for applying SNA measures to co authorship pattern and to prove that SNA measures illuminate the social structure of the authors. The following hypotheses have been validated to achieve the objectives of the study.

- The most prolific authors play vital roles in the co-authorship network as most influential, intermediary and core authors;
- The centrality ranking of a researcher greatly influences the research performance.

METHODS AND METHODOLOGY

The dataset for the study was confined to the Web of Science database consisting of 40072 bibliographical data for the period of 30 years from 1990 to 2019 in the topic of chromosome anomalies.

SNA Measures: The SNA measures broadly classified into micro, meso, and macro, which analyze the characteristics of the network from individual node to global or whole network level. The measures like density and degree distribution are applied to all levels; however, certain macro-level measures cannot be aggregated to the micro-level. The following SNA measures are identified from the literature (Newman, 2001; Otte, 2002; Virués-ortega, Pear, & Hurtado-parrado, 2011) have been deployed in this study.

Micro Network Measures: Micro or node level measures are used to study the attributes of the individual unit or node in the network. The most common such measures are centralities utilized to identify the best or prominent central node, one who is involved in many ties in the network. This measure is more appropriate for an undirected network where there is no direction in the relationship (Wasserman & Faust 1994), such as co-authorship or co-occurrence network. Freeman (1979) categorized centrality measures into three basic types: 1. Degree centrality, 2. Closeness centrality and Betweenness centrality.

Degree Centrality (C_D): Degree centrality is a common and simple centrality measure calculated by the number of ties a vertex connected or it is a degree of a vertex in the undirected network expressed as $C_D(n_i) = d(n_j)$ is standardized to . Where $C_D(n_i)$ is the degree centrality index for the node I; $d(n_j)$ is the total number of ties it has; g is the total number of nodes in the network and set a maximum to g-1 (Wasserman & Faust, 1994). In the co-authorship network, degree centrality indicates the number of times an author collaborated with others to produce or publish a research article.

Closeness centrality: It focuses on how close an actor (author) is for all the other actors (authors) in the set of actors (authors) (Wasserman & Faust,1994). This can be computed by $^{-1}$, where represent the closeness centrality index of the vertex I; and is the distance between the two vertices I and j (Wasserman & Faust1994). In simple terms, the closeness is nothing but the mean geodesic distance between an author to all other authors reachable from him. The closeness centrality for the network cannot be computed when there are disconnected vertices or presences of isolated nodes in the network. However, closeness can be calculated for connecting components. A minimum value of closeness for a node indicates the more central node in the network and it also includes the indirect connections of the nodes which were not considered in the degree centrality.

Betweennesscentrality: It is the number of shortest paths passing through a node. This measure takes into account the connectivity of the neighbors of the node, giving a higher value for nodes, which bridge clusters. It reflects the number of people who are connecting indirectly through their direct links. The betweenness index for the n_i is simply the sum of estimated probabilities over all vertices not including the *i*th vertex. The standardized formula for the computation of betweenness is

$$C_B(n_i) = \frac{C_B(n_i)}{[(g-1)(g-2)/2]}$$

$C_B(n_i) = C_B(n_i) / [(g-1)(g-2)/2]$ where is the betweenness centrality for the node *i*, which is the number of nodes not including new. Betweenness can be computed even if the graph is not connected (Wasserman & Faust 1994).

Meso Network Measures: Meso level network measures concentrate on the performance of a group of nodes/authors in both networks. The clustering techniques have been used to categorize the group of nodes based on the common attributes that exist among them.

Components: The most common clustering technique exploited in this study is the component. A component is a subgraph in which there is a path between all pairs of nodes (all pairs of nodes in a component are reachable). If there is only one component in a graph, the graph is connected. If "there is more than one component, the graph is disconnected" (Wasserman &Faust 1994, p.109). The non-directional network like co-authorship and co-occurrence network deploy weak component but in the direct network (like citation network) depend upon the direction of the arc strong and weak component used to partition the whole network into sub-network or graph. The isolates in the network represent the nodes that do not find any paths to other nodes. In the coauthorship network isolates indicates that the authors are not collaborated to publish an article or single-authored publications, conversely isolates in the citation network indicates the un-cited publications.

Macro network measures: Macro network measures are used to find out the structural attributes of the whole network. It can also be known as global network measures. The following are utilized in this study.

Density: The density implies the completeness of the network where every node in the network is directly connected with each other. It can be computed by the formula given by Scott (2000).

$$D = \frac{l}{n(n-1)/2} = \frac{2l}{n(n-1)}$$

where, l is the number of lines in the network; n is a number of nodes in the network.

Diameter: The diameter of a graph is the length of the longest geodesic path between any pair of vertices in the network for which a path actually exists (Newman, 2010). The diameter of a network ranges between a minimum of 1 when the network is complete and a maximum of g-1 when the network is not connected and the diameter is infinite. It is significant to find the diameter of a network because it calculates the farthest nodes in the network.

Distance: The distance between two nodes simply means the length of the geodesic of two nodes and geodesics means the shortest path between two nodes in a network.

Data analytical tools and software: The SNA study involves two analytical methods such as metric or measures that utilizerobotic calculations and visualization or mapping the measures results in networks. The following open-source data analytical software and tools are utilized for scientometrics and social network analysis.

Bibliometric Tools:	Bibexcel, Bibiometrix
SNA Software:	Pajek, UCINET 6 for Windows
Visualization Software:	VoS Viewer, EPS Viewer, and Inkscape

METHODOLOGICAL FRAMEWORK FOR CONSTRUCTION OF CO AUTHORSHIP NETWORK

The co-authorship network maps the collaborative pattern and social structure of authors in any field of study. The network consists of nodes represent authors connected by the line or link or edges indicates collaboration between the authors and the width of lines shows the number of times they have collaborated to publish one or more articles. It is also known as a unidirectional network because the links between the authors don't have the direction. The following figure 1 depicts the research design for applying the SNA measures to scientometrics studies.

Fig 1. Research Design Flow Chart

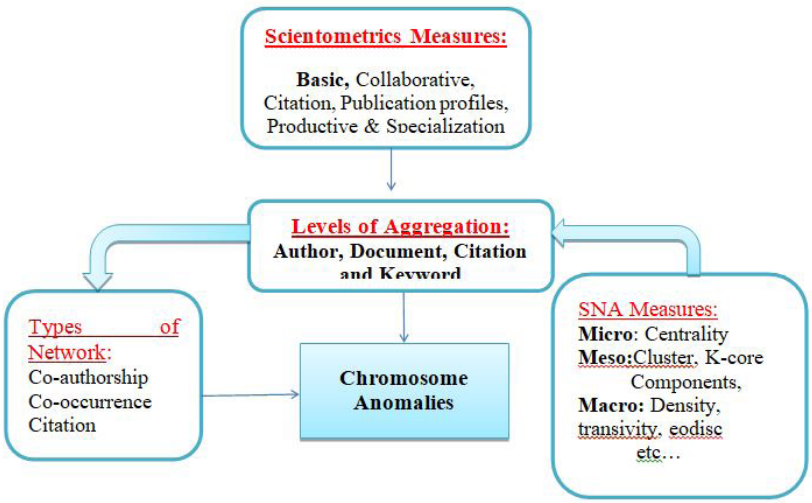

Figure 2 exemplified the process involved in the construction of a co-authorship network. The retrieved dataset was exported to bibexcel software for removing the duplicate records, standardizing the name of the authors. Bibexcel identified 40047 records and necessary files as given in the flow chart are created for social network analysis. The co-authorship network is built for the most productive authors with thresholds of 30 and more publications.

Macro Measures: Table 1 summarizes the macrostructural properties of the coauthorship network. The scale of the network is reduced by the threshold of 30 and more documents published by the authors which resulted in 307 authors, 296 have collaborated among them 4 authors' collaborators have not found in the threshold dataset and 7 authors produced a single-authored publication in the specified dataset. Hence the coauthorship network consists of 300 vertices (authors) with 2193 collaborated links.

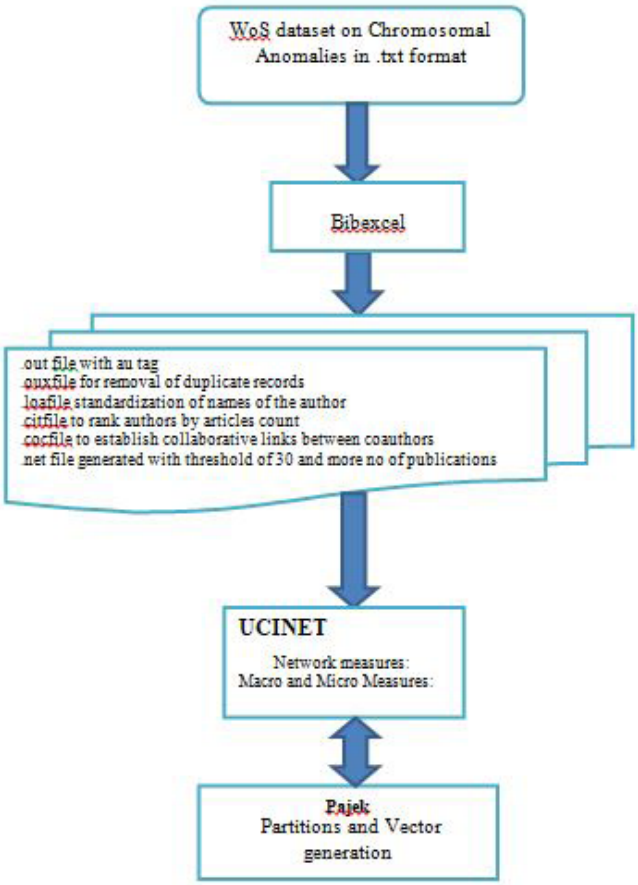

Figure 2: Construction of Co-authorship Network

The density for the coauthorship network 0.038 indicates that 3.8% of authors in the network collaborated with each other and the network is sporadic. It also implies that the authors in the subgroups were rarely collaborating with other groups. Another important macro network measures are the diameter and the average distance of the network. The longest shortest path between vertices in the coauthorship network is 8 indicates that the network was clustered into components. The average distance of 3.103 implies that the authors in the network required 3 .1 steps to reach another author in the network to collaborate. However, the low value of density resulted in a high average distance. The average degree of the network is used to measure the structural cohesion of the coauthorship network. The authors in the network were connected at the degree of 11.273. The probability of the author's two coauthors collaborated to publish an article is observed as 3.108 for the overall network and the weighted overall network clustering coefficient or transitivity is 1.981. There were 3 main components of subgroup identified in the network amongst, the largest component covered 296 vertices which means that 98.67% of the authors have collaborated directly or indirectly with each other. The centrality measures for the whole network revealed that all degree centrality of 0.103 and betweenness of 0.047 and the closeness centrality could not be computed because of the component or subgroups in the network.

The macro measures for the coauthorship network highlighted that the authors tend to collaborate among their research community and the existence of research communities also observed. The research ideas or

flow of knowledge between the authors are spreading slowly due to the sporadic feature of the network. The research field of chromosomal anomalies is a multidisciplinary field that involves clinical trials, experimental and diagnostic method resulted in an increased number of collaborators.

Table. 1: Network Properties of the Co-authorship Network

Network Properties	**1990-2019**
Nodes	296
Links / Edges	2193
No of links with value = 1	1233
No of links with value, not 1	960
Density	0.038
Average Degree	11.273
Component	3
Connectedness	0.974
Average distance	3.112
Diameter	8
Clustering Coefficient	3.108
Transitivity	1.981
All Degree Centralization	0.103
Betweenness Centralization	0.047

Micro Structure: Centrality Measures to the Co-authorship Network: The node-level or micro-level measures to the co-authorship network is applied to identify the most central, influential, collaborative, and intermediary author in the field of chromosomal anomalies. Table table 2 ranked the top 20 authors in terms of productivity and centrality measures namely, degree, closeness, and betweenness centrality. The normalized degree centrality freeman closeness and betweenness centrality measures are calculated for the authors of 300 and ranked first 20 authors in each category. The names of the author who appeared in all categories are highlighted in bold and italic fonts.

Degree Centrality: Degree centrality identifies the central author in the network by the number of co-authors or collaborators for an author have in the whole network. They occupy the central position to the structure of the network and have the capacity to influence others and also recognized as elite in the network.

In this study, Mitelman F(V.No. 2 Figure 3) has a high normalized degree centrality of 1.171 followed by Mandahl N(V.No. 1 Figure 3) (0.926) and Mertens F(V.No.4 Figure 3) (0.876). In total, 28 authors have shared the top 20 places and identified as the most popular authors by collaborating most frequently with many others in the network. The high degree centrality may also result in collaborating with multi authors in a publication rather than collaborating in more papers with few authors.

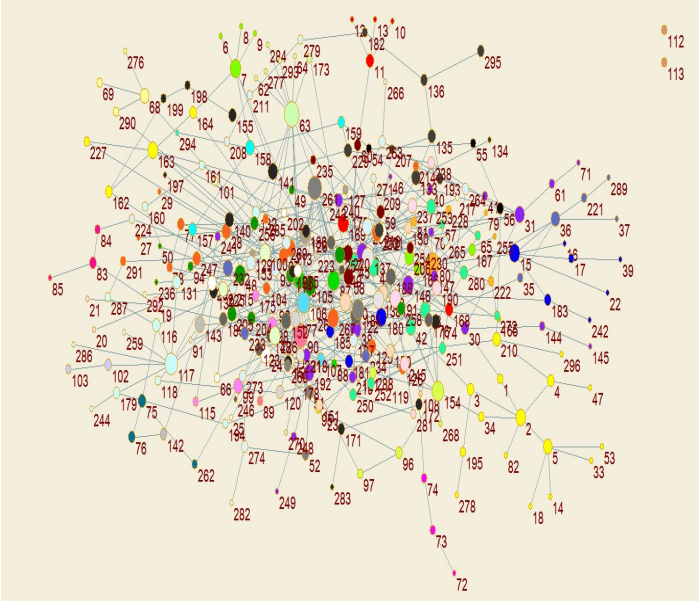

Figure 3: Co-authorship Network (threshold <30 publications)

Closeness Centrality: The closeness centrality of an author indicates that the distance or geodesic path between an author to all others in the network. Unlike degree centrality, it calculates the indirect link between the authors in the network. The most central author, Siebert R (V.No.105 Figure 3) (0.404) have collaboration with all others in the network through short paths followed by Hagemeijer A (V. No. 38 Figure 3) (0.4) and Rowley JD (V. No.261 Figure 3) (0.396). In total 46 authors occupied the top 20 positions in the ranking of closeness centrality. These authors are identified as the most influential authors in the field of chromosomal anomalies and they can able to extend the research ideas across the network more quickly.

Betweenness Centrality: A high value of betweenness for an author indicates that the author plays the role of connecting different subgroups in the network as middleman or intermediary. Totally 90 authors have occupied the top 20 places. 30% of authors in the network were recognized as most intermediary authors connecting different authors and strengthen collaboration in the network. Vermeesch JR(V. No.80 Figure 3) (0.051) ranked first followed by Siebert R (V. No.105 Figure 3) (0.05) who also identified as the most influential author in the coauthorship network. Natarajan AT(V. No.117 Figure 3) (0.037) occupied 3rd position. These authors can control the flow of information in the network. if these authors have removed from the network then the distance between others would have gone high and the density of the network drastically reduced.

Table 2: Social Network Analysis: Ranking of Authors

Rank	Author	NP	nDegree		F.Closeness		Betweenness	
1	Nicolaides KH	158	**Mitelman F**	**1.171**	**Siebert R**	**0.404**	Vermeesch JR	0.051
2	Liehr T	153	Mandahl N	0.926	**Hagemeijer A**	0.4	**Siebert R**	**0.05**
3	Heim S	137	Mertens F	0.876	Rowley JD	0.396	Natarajan AT Haas OA	0.037
4	Mitelman F	126	Heim S	0.849	Lupski JR	0.394	Liehr T	0.035
5	Natarajan AT	122	Vandenberghe H	0.712	Zhang Y	0.393	Wang X	0.033
6	Ried T	117	**Johansson B**	**0.602**	**Johansson B** Stankiewicz P	0.392	**Johansson B** Lupski JR	**0.031**
7	Johansson B	101	Lichter P	0.599	Schlegelberger B	0.388	**Mitelman F**	**0.029**
8	Mertens F **Siebert R**	100	Dohner H	0.595	Haas OA	0.386	Nakamura Y	0.028
9	Knuutila S	97	Cheung SW	0.592	Li J Wang X	0.385	Li J	0.027
10	Lichter P	96	Wlodarska I	0.555	Vermeesch JR	0.384	Zhang L	0.026
11	Mandahl N	92	Stankiewicz P	0.522	Ried T Harrison CJ Zhang L	0.383	**Hagemeijer A**	0.024

Rank	Author	NP	nDegree		F.Closeness		Betweenness	
					Mitelman F		Sole F	
					Wang Y		Wang Y	
12	Wang Y	86	Ott G	0.518	Chen Y	**0.381**	Kaneko Y	0.023
							Zhang Y	
							Ullmann R	
	Lupski JR						Darroudi F	
	Shaffer LG						Meyer C	
13		79	Bentz M	0.502	Morton CC	0.38	Schlegelberger B	0.022
							Chen Y	
			Patel A				Cheung SW	
14	Bullerdiek J	78	Michaux L	0.498	Michaux L	0.379	Beverloo HB	0.021
	Durante M						Raimondi SC	
15	Jauch A	77	Lupski JR	0.485	Jauch A	0.378	Berger R	0.02
							Wang H	
	Zhang Y				Cheung SW		Nicolaides KH	
16	Li J	76	Haferlach T	0.482	Raimondi SC	0.377	Jauch A	0.019
							Morton CC	
	Dohner H						Stoll C	
	Sasaki K						Shaffer LG	
17		75	Siebert R	**0.472**	Berger R	0.376	Yamamoto K	0.018
							Vankessel AG	

Rank	Author	NP	nDegree		F.Closeness		Betweenness	
							Schrock E	
							Harrison CJ	
							Hayashi M	
18	Cheung SW	73	Dalcin P	0.465	Haferlach C	0.375	Wang W	0.017
							Nakamura T	
							Dastugue N	
							Pinkel D	
	Hagemeijer A				Patel A		Stankiewicz P	
	Schlegelberger B				Wang J		Rubio C	
					Kaneko Y		Garciamanero G	
19		72	**Hagemeijer A**	0.448		0.374	Norppa H	0.016
							Ogawa S	
							Egozcue J	
							Bridge JA	
			Rubio C				Rowley JD	
			Schnittger S				Choy KW	
20	Medeiros LJ	71		0.441	Fonatsch C	0.373	Seto M	0.015
							Li L	

Collaborative Pairs: Table 3 ranked the 10 most collaborative pairs of authors The link strength is nothing but the number of times an author collaborated with a particular author in publishing articles. It is observed that Mandahl N-Mitelman F has collaborated together to publish 50 articles in the field of chromosomal anomalies during the study period followed by Mitelman F-Johansson B (41) and Mitelman F-Mertens F (40), Oga A-Sasaki K (40).

Table 3: Ten Most Collaborative Pairs

Rank	Collaborative Authors	Link Strength
1	Mandahl N-Mitelman F	50
2	Mitelman F-Johansson B	41
3	Mitelman F-Mertens F	40
4	Oga A-Sasaki K	40
5	Mitelman F-Heim S	38
6	Zemanova Z-Michalova K	36
7	Sasaki K-Kawauchi S	35
8	Sasaki K-Furuya T	33
9	Douetguilbert N-Debraekeleer M	31
10	Bartnitzke S-Bullerdiek J	30

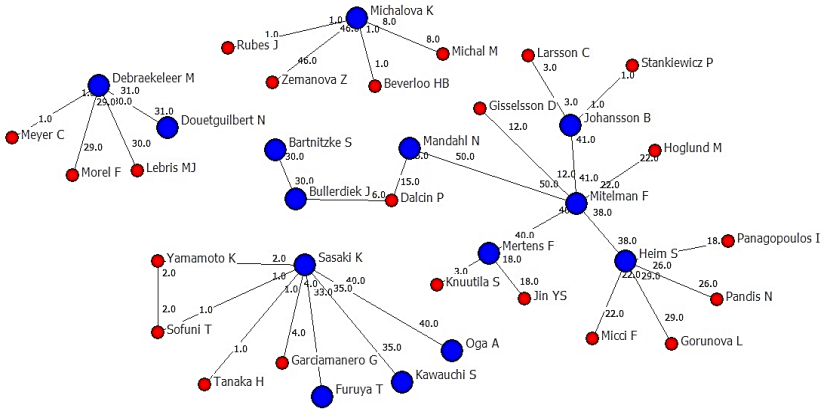

Figure 4: Ego Networks of the Top Ten Collaborators in the field of Chromosomal Anomalies during the period 1990-2019. (Ego Network created in Net Draw)

Figure 4.visualizes the ego networks of the top ten most collaborative pairs of authors represented by blue and their collaborators are indicated in red nodes. The link strength between collaborators is marked in numbers. It is obvious, Mitelman F has a maximum number of collaborators in the co-authorship network, resulted in a high degree of centrality (Table 2).

A Comparative Analysis of Productivity and Centrality Measures The SNA approach to the research output on chromosomal anomalies brought more insights into the role of authors in the respective field. It also identifies the most central, influential, and intermediary authors who enable the smooth flow of information, control over the information, and facilitates information sharing in the field. The scientometric approach identified Nicolaides KH as the most productive author with 158 publications in the field, however, the SNA approach recognized his role as an intermediary with 0.019 betweenness centrality because of his non-collaborative pattern in the publication. Similarly, Liehr T has published 153 articles and ranked 2nd in the most prolific author could not be recognized as the most influential or central author in the network however he acted as a middle man in the network with 0.035 betweenness and occupied 4th rank. The 3rd prolific author Heim S is recognized as the 4th central author in the network with 0.849 normalized degree centrality implies that he collaborated with a large number of authors in the research field. Mitelman F, Siebert R, Johansson B are the author who has been identified as the most prolific, central, influential, and intermediary author in the field (Table 2).

Hypothesis 1: The most prolific authors play key roles in the co-authorship network as a most influential, intermediary, and productive authors

Pearson's correlation coefficient values are computed between three centrality measures and the total productivity of the authors presented in the coauthorship network. Thus, the centrality measures for the most 300 productive authors are correlated with their productivity and presented in table 4. The normalized degree centrality and betweenness centrality values of the coauthors are positively correlated with productivity infers that coauthored publications increase the productivity of the authors and the authors who bridge the gap or perform the role of middle man also increase the productivity. Similarly, a positive correlation between closeness and productivity also identified at r = 0.70 which greater than 0.05 and can be considered as more than average positive correlation. The critical value of t (1.967) < calculated value (114.19, 16.77, 96.84 respectively) validates the hypothesis "The most prolific authors play key roles in the co-authorship network as most influential, intermediary and central authors".

Table 4: Correlation between Productivity and Centrality Measures

Pearson's rho	**Productivity**	**α = 0.05 level (2 - tailed) df (298)**	
Centrality Measures	**Correlation Coefficient (r)**	***t Stat***	***P-value***
Ndegree	0.99	114.19	0.000
Free.Closeness	0.70	16.77	0.000
Betweenness	0.98	96.84	0.000

Hypothesis 2: The centrality ranking of a researcher greatly influence the research performance

The hypothesis was tested with 300 authors who have published a minimum of 30 articles in the retrieved dataset. The citation-based performance measures such as total citations, h-index, and g-index have been extensively used to evaluate the performance of the research scholars. At the same time SNA particularly, centrality measures deployed to study the structural positions of the authors in the network also play a vital role in performance evaluation. Hence, the centrality ranking of a researcher over the performance measures was tested with the Spearman Rank Correlation Coefficient. Table 5 shows that the correlation coefficient of SNA and performance-based measures which were positively correlated at rho= 0.5> depicts the above-average correlation among these measures. The correlation between the Betweenness centrality of the scholar and performance-based measures was identified as low compared to other measures, particularly the positive correlation between Betweenness centrality and h-Index were least among other measures. The fitness of the model is tested with t-statistics at 0.05 two-tailed test provided in Table 6 proves that α =0.05 < p values validates the given hypothesis.

Table 5: Correlation between Citation based Performance Measures and SNA Measures of Most Prolific Authors in the field of Chromosomal Anomalies (N = 300)

Variables	**Total Citation (r^2)**	**H-Index (r^2)**	**G-Index (r^2)**
nDegree Centrality	0.72	0.71	0.72
Free. Closeness Centrality	0.72	0.71	0.72
Betweenness Centrality	0.70	0.69	0.70
Spearman Rank Correlation is significant at the 0.05 level (2-tailed test) N= 300			

The SNA centrality measures of the research scholar in the field of chromosomal anomalies are greatly influenced by the performance-based measures.

Table 6: Fitness Model Critical t value (1.97) at α = 0.05

Variables	**Total Citation (t- test)**	**H-Index (t- test)**	**G-Index (t- test)**
nDegree Centrality	t<27.80 ;α <*90E-85*	t<26.21 ;α <*4.E-81*	t< 27.42 ;α <*1.8E-83*
Free. Closeness Centrality	t<27.83 ;α <*7.42E-85*	t<26.69 ;α <*5.34E-81*	t<27.43 ;α <*71.62E-83*
Betweenness Centrality	t<26.53 ;α <*1.82E-80*	t<25.52 ;α <*90E-85*	t<26.35 ;α <*5.92E-77*

CONCLUSION

The scientometrics indicators analyze the character and attributes of the entities. However, Social Network Analysis (SNA) mainly analyzes the pattern or structure of relationships prevailing among the nodes/actorsand attributes of actors are secondary.With the advent of information and communication technologies, the discipline information science started utilizing the techniques of SNA to map research productivity, evaluate the research performance, support the development of science policy, and study the intellectual and social structure of knowledge.

This study suggests the methodological framework for applying SNA measures to the co authorship pattern. The same can also be applied to other networks such as citation network, co citation network, and co-occurrence network. However advanced centrality measures Hub and authority, main path method also utilized to illuminate conceptual intellectual structure of any given field of study.

NOTE

This article is based on the Ph.D. thesis "Research output on chromosome anomalies: an empirical analysis.

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APPENDIX

APPENDIX – A : CENTRALITY MEASURES OF AUTHORS

(Threshold of a minimum of 30 publications)

Vertex No	Author	nDegree	FCloseness	Betweenness
1	Mandahl N	0.926	0.336	0.003
2	Mitelman F	1.171	0.381	0.029
3	Johansson B	0.602	0.392	0.031
4	Mertens F	0.876	0.347	0.006
5	Heim S	0.849	0.324	0.002
6	Oga A	0.348	0.263	0
7	Sasaki K	0.425	0.32	0.011
8	Kawauchi S	0.341	0.271	0
9	Furuya T	0.324	0.271	0
10	Douetguilbert N	0.331	0.272	0
11	Debraekeleer M	0.358	0.272	0
12	Lebris MJ	0.334	0.3	0.004
13	Morel F	0.358	0.272	0
14	Gorunova L	0.328	0.319	0.001
15	Rubio C	0.441	0.299	0.016
16	Simon C	0.375	0.293	0.007
17	Pellicer A	0.368	0.245	0

Vertex No	Author	nDegree	FCloseness	Betweenness
18	Pandis N	0.284	0.308	0
19	Stoll C	0.217	0.288	0.018
20	Dott B	0.184	0.225	0
21	Alembik Y	0.181	0.225	0
22	Remohi J	0.355	0.245	0
23	Dohner H	0.595	0.348	0.006
24	Lichter P	0.599	0.329	0.002
25	Bentz M	0.502	0.327	0.001
26	Stilgenbauer S	0.411	0.336	0.002
27	Kern W	0.365	0.315	0
28	Haferlach T	0.482	0.332	0.001
29	Schnittger S	0.441	0.35	0.007
30	Dalcin P	0.465	0.357	0.011
31	Vandenberghe H	0.712	0.362	0.012
32	Wlodarska I	0.555	0.369	0.009
33	Micci F	0.161	0.291	0.001
34	Hoglund M	0.425	0.368	0.008
35	Spencer K	0.114	0.258	0
36	Nicolaides KH	0.224	0.293	0.019
37	Snijders RJM	0.1	0.248	0.001
38	Hagemeijer A	0.448	0.4	0.024
39	Rodrigo L	0.298	0.231	0
40	Sciot R	0.331	0.335	0.003

Vertex No	Author	nDegree	FCloseness	Betweenness
41	Mecucci C	0.291	0.364	0.008
42	Stankiewicz P	0.522	0.392	0.016
43	Lupski JR	0.485	0.394	0.031
44	Cheung SW	0.592	0.377	0.021
45	Patel A	0.498	0.374	0.012
46	Dewolfpeeters C	0.308	0.354	0.002
47	Jin YS	0.234	0.332	0.003
48	Ott G	0.518	0.348	0.004
49	Rosenwald A	0.401	0.347	0.006
50	Mullerhermelink HK	0.301	0.318	0
51	Meijer GA	0.147	0.292	0.001
52	Ylstra B	0.134	0.3	0
53	Panagopoulos I	0.284	0.312	0.001
54	Bayani J	0.157	0.295	0
55	Squire JA	0.177	0.295	0
56	Zielenska M	0.144	0.293	0.001
57	Beaudet AL	0.348	0.341	0.002
58	Drexler HG	0.207	0.371	0.011
59	Macleod RAF	0.197	0.366	0.009
60	Meyer C	0.157	0.362	0.022
61	Michaux L	0.498	0.379	0.013
62	Weise A	0.147	0.306	0.002
63	Liehr T	0.281	0.359	0.035

Vertex No	Author	nDegree	FCloseness	Betweenness
64	Claussen U	0.1	0.295	0
65	Shaw CA	0.334	0.348	0.001
66	Moller P	0.385	0.352	0.009
67	Haferlach C	0.365	0.375	0.014
68	Sharma A	0.144	0.255	0.014
69	Talukder G	0.127	0.204	0
70	Marynen P	0.211	0.372	0.005
71	Dierlamm J	0.268	0.356	0.004
72	Shimojima K	0.154	0.281	0
73	Yamamoto T	0.181	0.301	0.001
74	Okamoto N	0.11	0.278	0
75	Rossner P	0.14	0.279	0.001
76	Sram RJ	0.147	0.279	0.001
77	Schoch C	0.324	0.363	0.008
78	Hiddemann W	0.247	0.32	0.001
79	Fryns JP	0.171	0.32	0.003
80	Vermeesch JR	0.311	0.384	0.051
81	Devriendt K	0.211	0.349	0.005
82	Gisselsson D	0.247	0.324	0.001
83	Garne E	0.14	0.276	0.004
84	Dolk H	0.117	0.276	0.004
85	Rankin J	0.087	0.217	0
86	Schrock E	0.204	0.369	0.017

Vertex No	Author	nDegree	FCloseness	Betweenness
87	Ried T	0.217	0.383	0.012
88	Dumanoir S	0.184	0.341	0.003
89	Moorman AV	0.161	0.359	0.004
90	Harrison CJ	0.214	0.383	0.017
91	Chen CP	0.047	0.271	0
92	Wang W	0.241	0.369	0.017
93	Medeiros LJ	0.187	0.342	0.006
94	Campo E	0.217	0.334	0.003
95	Vandenberg E	0.097	0.325	0.001
96	Dejong B	0.147	0.314	0.001
97	Oosterhuis JW	0.127	0.324	0.001
98	Zemanova Z	0.191	0.31	0.001
99	Michalova K	0.224	0.331	0.01
100	Gascoyne RD	0.261	0.362	0.006
101	Horsman DE	0.134	0.342	0.001
102	Lloyd DC	0.097	0.264	0
103	Edwards AA	0.097	0.264	0
104	Haase D	0.237	0.346	0.007
105	Siebert R	0.472	0.404	0.05
106	Raimondi SC	0.181	0.377	0.02
107	Pui CH	0.124	0.326	0.001
108	Espinet B	0.231	0.339	0.001
109	Sole F	0.358	0.372	0.023

Vertex No	Author	nDegree	FCloseness	Betweenness
110	Calasanz MJ	0.341	0.371	0.01
111	Lu XY	0.167	0.349	0.004
112	Unal F	0.057	0.111	0
113	Yilmaz S	0.057	0.111	0
114	Schlegelberger B	0.284	0.388	0.022
115	Michal M	0.03	0.271	0
116	Darroudi F	0.144	0.314	0.022
117	Natarajan AT	0.251	0.327	0.037
118	Palitti F	0.077	0.283	0.001
119	Cigudosa JC	0.171	0.35	0.002
120	Vodicka P	0.114	0.289	0.001
121	Hemminki K	0.144	0.327	0.008
122	Dastugue N	0.224	0.367	0.017
123	Mugneret F	0.184	0.351	0.011
124	Baudis M	0.144	0.329	0.003
125	Germing U	0.154	0.334	0
126	Fonatsch C	0.241	0.373	0.011
127	Kantarjian H	0.067	0.337	0.001
128	Garciamanero G	0.194	0.366	0.016
129	Kantarjian HM	0.124	0.347	0.004
130	Hernandez JM	0.237	0.36	0.005
131	Obe G	0.12	0.317	0.009
132	Wojcik A	0.05	0.293	0.003

Vertex No	Author	nDegree	FCloseness	Betweenness
133	Lee JH	0.14	0.307	0.006
134	Lee KH	0.097	0.252	0
135	Kim HJ	0.12	0.293	0.003
136	Kim SH	0.11	0.304	0.006
137	Rosenfeld JA	0.234	0.364	0.012
138	Shaffer LG	0.244	0.369	0.018
139	Nakamura S	0.094	0.309	0.004
140	Seto M	0.151	0.33	0.015
141	Yamamoto K	0.137	0.34	0.018
142	Bonassi S	0.09	0.3	0.006
143	Norppa H	0.127	0.325	0.016
144	Bullerdiek J	0.171	0.32	0.001
145	Bartnitzke S	0.124	0.286	0
146	Morton CC	0.154	0.38	0.019
147	Gusella JF	0.11	0.334	0.005
148	Gunawan B	0.12	0.29	0.007
149	Fuzesi L	0.11	0.226	0
150	Chaganti RSK	0.137	0.355	0.004
151	Rao PH	0.144	0.354	0.004
152	Berger R	0.127	0.376	0.02
153	Wang J	0.134	0.374	0.012
154	Vankessel AG	0.134	0.359	0.018
155	Takahashi T	0.147	0.311	0.011

Vertex No	Author	nDegree	FCloseness	Betweenness
156	Taniwaki M	0.11	0.329	0.008
157	Hayashi M	0.134	0.324	0.017
158	Sofuni T	0.11	0.315	0.006
159	Suzuki T	0.07	0.319	0.001
160	Durante M	0.087	0.266	0
161	Ritter S	0.067	0.294	0.003
162	Yoshida K	0.09	0.325	0.006
163	Ogawa S	0.13	0.366	0.016
164	Tanaka H	0.054	0.31	0.003
165	Gianaroli L	0.057	0.272	0.001
166	Munne S	0.097	0.31	0.005
167	Wells D	0.043	0.305	0.002
168	Leung TY	0.107	0.334	0.01
169	Choy KW	0.154	0.369	0.015
170	Li J	0.217	0.385	0.027
171	Abe T	0.13	0.301	0.005
172	Inazawa J	0.087	0.305	0.001
173	Gebhart E	0.05	0.291	0.001
174	Nakamura Y	0.107	0.36	0.028
175	Jarosova M	0.06	0.314	0.001
176	Speleman F	0.164	0.366	0.011
177	Kumar R	0.074	0.337	0.011
178	Chen Z	0.124	0.348	0.004

Vertex No	Author	nDegree	FCloseness	Betweenness
179	Zdzienicka MZ	0.057	0.266	0.009
180	Jauch A	0.154	0.378	0.019
181	Goldschmidt H	0.114	0.322	0.006
182	Kim H	0.037	0.278	0.001
183	Egozcue J	0.074	0.291	0.016
184	Pinkel D	0.057	0.362	0.017
185	Speicher MR	0.054	0.333	0.001
186	Hayashi Y	0.094	0.341	0.007
187	Sandberg AA	0.07	0.343	0.005
188	Andrieux J	0.09	0.359	0.012
189	Bastard C	0.1	0.343	0.008
190	Zhang J	0.09	0.352	0.004
191	Wang Y	0.174	0.381	0.023
192	Beverloo HB	0.097	0.364	0.021
193	Lee S	0.06	0.34	0.008
194	Joenje H	0.027	0.268	0.002
195	Larsson C	0.064	0.331	0.004
196	Kaneko Y	0.08	0.374	0.023
197	Suzuki H	0.054	0.31	0.001
198	Kamada N	0.094	0.31	0.001
199	Tanaka K	0.09	0.29	0.002
200	Zhang Y	0.127	0.393	0.023
201	Zhang L	0.127	0.383	0.026

Vertex No	Author	nDegree	FCloseness	Betweenness
202	Smith MT	0.023	0.289	0
203	Eastmond DA	0.027	0.303	0.004
204	Harbott J	0.11	0.361	0.003
205	Haas OA	0.104	0.386	0.037
206	Simpson JL	0.043	0.323	0.005
207	Kim J	0.05	0.279	0
208	Li Y	0.114	0.359	0.011
209	Cheng L	0.037	0.312	0.004
210	Knuutila S	0.067	0.311	0.012
211	Guan XY	0.054	0.339	0.003
212	Sanlaville D	0.1	0.348	0.009
213	Vekemans M	0.057	0.334	0.007
214	Saad A	0.017	0.272	0
215	Chen Y	0.1	0.381	0.022
216	Lee J	0.07	0.348	0.013
217	Liu L	0.023	0.315	0
218	Marchetti F	0.084	0.298	0.002
219	Wyrobek AJ	0.08	0.274	0
220	Schwartz S	0.05	0.338	0.004
221	Sepulveda W	0.02	0.228	0.007
222	Zuffardi O	0.037	0.329	0.001
223	Nothen MM	0.027	0.295	0.001
224	Wang H	0.07	0.356	0.02

Vertex No	Author	nDegree	FCloseness	Betweenness
225	Sanger WG	0.067	0.337	0.005
226	Heerema NA	0.087	0.353	0.008
227	Maciejewski JP	0.047	0.319	0
228	Emanuel BS	0.023	0.319	0
229	Takeda S	0.027	0.307	0.001
230	Ledbetter DH	0.054	0.342	0.002
231	Scherer SW	0.077	0.357	0.011
232	Nakamura T	0.09	0.352	0.017
233	Croce CM	0.05	0.311	0.001
234	Bloomfield CD	0.03	0.32	0.002
235	Bryant PE	0.01	0.282	0.001
236	Fletcher JA	0.05	0.336	0.004
237	Wang L	0.077	0.357	0.012
238	Liu Y	0.09	0.351	0.009
239	Rauch A	0.037	0.331	0.004
240	Szuhai K	0.084	0.357	0.009
241	Rosenberg C	0.067	0.353	0.01
242	Borrell A	0.007	0.226	0
243	Chitayat D	0.023	0.304	0
244	Kaina B	0.007	0.211	0
245	Zhang H	0.074	0.368	0.011
246	Young BD	0.017	0.31	0
247	Bernheim A	0.047	0.327	0.007

Vertex No	Author	nDegree	FCloseness	Betweenness
248	Deklein A	0.03	0.269	0.007
249	Vanopstal D	0.017	0.213	0
250	Ketterling RP	0.033	0.309	0.005
251	Fonseca R	0.02	0.255	0
252	Kumar S	0.02	0.281	0.001
253	Wang X	0.137	0.385	0.033
254	Kumar A	0.013	0.303	0
255	Liebaers I	0.023	0.299	0.003
256	Ullmann R	0.043	0.336	0.023
257	Tommerup N	0.04	0.327	0.004
258	Schinzel A	0.03	0.317	0.002
259	Marcos R	0.013	0.265	0
260	Lebeau MM	0.104	0.364	0.006
261	Rowley JD	0.124	0.396	0.015
262	Rubes J	0.017	0.261	0.001
263	Li JY	0.037	0.318	0.002
264	Avetloiseau H	0.043	0.317	0.009
265	Yang Y	0.064	0.349	0.005
266	Li L	0.07	0.359	0.015
267	Slovak ML	0.094	0.368	0.005
268	Ramaekers FCS	0.007	0.265	0
269	Bridge JA	0.064	0.343	0.016
270	Owen MJ	0.017	0.289	0.001

Vertex No	Author	nDegree	FCloseness	Betweenness
271	Li X	0.08	0.353	0.006
272	Stratakis CA	0.017	0.311	0.001
273	Liu J	0.04	0.337	0.005
274	Li H	0.06	0.344	0.01
275	Eggermann T	0.037	0.333	0.008
276	Mukherjee A	0.01	0.204	0
277	Pellestor F	0.013	0.266	0
278	Nordenskjold M	0.023	0.32	0
279	Wang Q	0.037	0.316	0.003
280	Zhou Y	0.037	0.341	0.011
281	Jenkins RB	0.023	0.306	0.002
282	Zhang W	0.027	0.309	0.001
283	Suzuki K	0.01	0.264	0
284	Vorsanova SG	0.007	0.266	0
285	Tachdjian G	0.007	0.284	0
286	Takahashi CS	0.003	0.248	0
287	Rueff J	0.013	0.269	0.001
288	Werner M	0.01	0.294	0
289	Evans MI	0.003	0.186	0
290	Gembruch U	0.007	0.254	0.001
291	Dutrillaux B	0.01	0.29	0.002
292	Mark HFL	0.01	0.292	0
293	Martin RH	0.003	0.266	0

Vertex No	Author	nDegree	FCloseness	Betweenness
294	Little JB	0.007	0.247	0.001
295	Kim JH	0.003	0.288	0.007
296	Peltonen L	0.003	0.238	0