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AUTHORS COLLABORATION IN DIGITAL LITERACY FROM 1997 TO 2013: A BIBLIOMETRIC STUDY

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ABSTRACT

The study aims to identify the degree of authors collaboration among scholars in digital literacy articles published from 1997-2013. The 661 digital literacy articles were gathered and indexed by Web of Science. The study found that the degree of author collaboration was 0.62 or 62%, indicating that more than a half of 661 articles were multi-authored papers. In addition, America Continents have proportionally contributed in discussing about digital literacy topic. It was then followed by European countries, Australia/Oceania, Asia, and Africa respectively. The study also figured out that Eszter Hargittai was the most prolific author who has published 8 articles in different journals on this particular topic.

KEY WORDS: Authors collaboration, Bibliometric, Digital literacy, Subramanyam's law

1. INTRODUCTION

a. Background of Study

Bibliometric study is an important area in library and information science (LIS). It has a long history dating back to the early decades of the past century, from the conventional matters till today digital age. The terms 'bibliomtetrics' was first coined by Alan Pritchard in his 1969's paper (Pritchard, 1969). The objective of bibliometric study is to analyse a body of literature or scholarly works using quantitative methods (statistical and mathematical), to extract the possible relationships between the elements that compose it (Rader, 2002). Other definition mentioned by Wilson (cited in Andres, 2009) that it was the application of mathematical and statistical methods to books and other media of communication. Hence, bibliometrics is indeed very important in library and information science to perform mathematical calculations on library resources.

Nowadays, the study has been applied not only to determine the phenomenon or scholarly communication based on information gathered from tangible sources but also those obtained from electronic information sources since many scholarly works today are indexed and collected by computer systems in which it is called as online databases. There is a current trend where people will be more likely to seek information on the internet. Therefore, the sources that will be examined in the present study also come from the internet through Web of Science, an online subscription-based scientific citation that consists of many scholarly online publication.

Academic work increasingly relies on teamwork, just as industrial production does (Posner, 2001 cited in Andres, 2009). It is a trend today people are likely to work together with others than working alone. Especially with today advanced technology devices that allow people around the world to work with. Scholars can now collaborate with others either locally or internationally. In fact, many evidences have shown that it might result much valuable findings through collaboration with others than doing it personally. In turn, it might increase the quality of knowledge and publication studies or productivity, and improve the growth body of knowledge.

The purpose of doing collaboration is to shape networked studies among scholars in the world. Sharing knowledge is not having boudaries and not limited anymore, one can now knowledge others anytime and anywhere. Various organizations either academic or non-academic fields have turned to collaboration as a way of increasing profits and creating new opportunities for growth. It is therefore important to notice that collaboration is a good option to do.

Many bibliometric studies have measured of the level of author collaboration in different fields, but not one has been studying the field of digital literacy authorship pattern. As the number of digital literacy articles is increasing today over the years (see figure 1), it is therefore, the current study is aimed to measure the degree of author collaboration in this particular topic.

b. Problem of Statement

Since the inception of terms "digital literacy" by Paul Gilster in 1997, scholars have recognized that digital literacy should be being considered as an important aspect in any discipline. It is seen from the early observation of the study that there was an increasing trend in writing digital literacy articles from 1997 to present days, as provided in the line graph below. The data were found through ISI Web of Science.

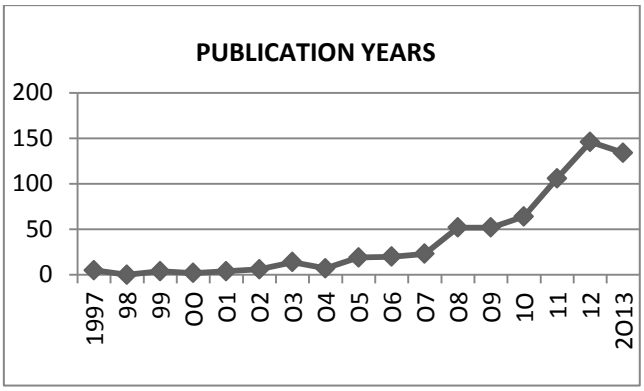

Figure 1. Numbers of digital literacy articles published from 1997-2013

As seen in figure 1, the number of publication in digital literacy was increasing over the years and it reacehd the peak in mid 2012 in which the number of articles was above 140 articles. The first decade since it was introduced, the number of articles was under 20 articles only. Starting in mid 2007, the publication was increasing up to 20 articles. It is therefore important to know the trend of author collaboration in this particular topic. In order to know its degree, the current study will utilize Subramanyam's law where many bibliometrics studies have also used the same law to measure the degree of author collaboration.

c. Research Objectives

The main aim of research is to find out truth which is hidden and has not been discovered. As mentioned earlier that many studies have researched about the trend of author collaboration in any discipline, but no a single study has measured the degree of author collaboration in the field of digital literacy. The following are the objectives of study.

1. To identify the number of authors contributing
2. To determine the prolific authors
3. To determine authors by geographical location
4. To determine authors by institutions
5. To determine the more productive journals

d. Research Questions

Research questions provide a guide for conducting a literature search. It presents the problem that is being addressed and reveals possible search terms. In order to make this study more clearly, it is necessary to have research questions in which these questiones were derived from research objectives, as follows:

1. What are the authorship patterns in digital literacy?
2. Who are the prolific authors in digital literacy?
3. Where the more productive countries in digital literacy?
4. Where the more productive institutions in digital literacy?
5. Which are the more productive journals in digital literacy?

e. Significance of the Study

This research is expected to measure the degree of author collaboration in digital literacy articles from 1997-2013. By identifying the trend, it can perhaps benefit bibliometricians, scholars, teachers, or students who are involved in to explore more about the field.

f. Limitation of the Study

The term of digital literacy is definitely related to other terms such as computer literacy, library literacy, network literacy, internet literacy, hyper-text literacy, etc. However, the term is difinitely different with other literacies mentioned above. Its literacy has own definition as will be defined in the next chapter. In order to provide clarity about what this research is going to study, limitations of study were determined, as follows:

1. The selected data were articles and written in English language, and were indexed by ISI Web of Science as well
2. The timespan of publication was from 1997-2013
3. It is assumed that the selected articles were relevant in digital literacy topic.

g. Definition of Terms

This section provides definition of terms used in the study, as follows:

1. *Collaboration*--the action of working with someone to produce something
2. *Author collaboration*--two or more people working together, either practice or theory, to produce something that are contributing to the body of knowledge
3. *Single-authored papers*--documents written by a one author
4. *Multi-authored papers*--documents written by more than one author
5. *Digital literacy*--the skills, knowledge, creativity and attitudes that are necessary to be able to use digital media for learning and mastering in the knowledge society. It is literacy that is needed to be able to use new digital tools and media in a creative and critical way.

2. LITERATURE REVIEW

As was mentioned earlier that bibliometrics study was important in library and information science. There have been many researchers conducting such studies. This chapter discusses previous findings on the degree of authors collaboration in several fields.

Collaboration may be used synonymously with multiple authorship (authorship, multiple) or co-authorship. It also refers to the broader concept of two or more researchers (or researchers from two or more organizations or countries) working together (Diodato, 1994). The increasing of information technology devices such as the internet is one of essential matters that will lead to an integration among scholars worldwide with different fields or organizations, and make it easier sharing information.

In 1997, it was a paper entitled "what is research collaboration?", written by Katz and

Martin. It was widely assumed that collaboration in research is "a good thing" and that it should be encouraged (Katz & Martin, 1997). Many individuals have nowadays recognized the importance of doing research together. Beside to increase productivy, collaboration also can perhaps overcome the barriers that reseacher challenges.

Bakri and Willet (2008) investigated the characteristics of authorship in *Malaysian Journal of Library and Information Science*, and found that there was an increasing trend in the proportion of multi-author contribution in certain period of times. A comparative study in information literacy between two different fields reported that a high rate of collaboration in health sciences, but lower in social sciences (Pinto, Escalona-Fernandez, and Pulgarin, 2012). The similar findings also revealed that researchers in Malaysia tend to collaborate with others but more dominant in science-based research than social sciences (Cheng, *et al*., 2012). Contrary, a research revealed that collaboration with those from Muslim countries was considered low (Abu Bakar and Putri Junurham, 2013)

A study reported that the degree of collaboration in *Journal of Financial Crime* during the years 2006-2010 was 0.246, which meaning that most articles in this particular journal were written by single author (Jena, Swain, and Sahoo, 2012). There was interdisciplinary trend between library and information science and other disciplines (Lariviere, Sugimoto, and Cronin,200?). Sin (200?) found that there was an increasing number in the internationalization of library and information science over the years.

Most articles in LIS, in case of Bangladesh, are (86%) single authored. It proves that researchers in this particular country might not consider that collaboration is a "good idea". A similar finding (Swain, Swain, and Rautaray, 2013) on authorship pattern in *Library Review* found that the degree of collaboration of the five-year publication from 2007-2012 was 0.36.

An investigation revealed that the co-authored papers are dominated in the marine sciences literature. It is found that the average collaboration rate was 0.57, and the mean number of authors per joint authored papers was 3.4 (Elango and Rajendran, 2012).

The collaboration among Iranian researchers with other researchers from overseas was quite significant, and its trend had increased between 1998 and 2007 (Hayati, and Didegah, 2010).

Based on studies above that each field of science has a different level of author collaboration. Some studies indicated a high level of collaboration among authors, while others showed low levels of collaboration. Due to no one has ever measured the level of author collaboration in digital literacy field, therefore, this study is aimed to identify its level of author collaboration for selected articles published from 1997 to 2013.

a. Digital Literacy

As a reminder, digital literacy was first introduced by Paul Gilster in 1997 as "the ability to understand and to use information from a variety of digital sources when it is presented via computers and regarded it simply as literacy in the digital age" (Gilster, 1997). He added in an interview with Pool (1997) that more important in its literacy was to evaluate and integrate information in multiple formats that computer can deliver.

Digital literacy, according to Hague and Payton (2010) on their handbook, is the ability to make and share meaning in different modes and formats; to create, collaborate, and communicate effectively and to understand how and when digital technologies can best be used to support these processes. It involves finding and selecting relevant information, critically evaluating and re-contextualizing knowledge and is underpinned by an understanding of the cultural and social contexts in which this takes place.

Digital Natives, the Net Generation, the Millennial Generation, and Generation M,

these individuals are said to have been "born digital" into the late twentieth and early twentieth-first centuries. They are native speakers of Google and Youtube era. These individual are not getting difficulties to translate or learn ICT, but merely experience it, and perhaps this literacy has become a part of educational curriculum either developed or developing countries.

Various terms related to digital literacy, as discussed on Bawden's paper (2001), are information literacy itself as the root of literacy, computer literacy, library literacy, media literacy, and network literacy. However, it is important to know that the current study focuses on when Paul Gilster introduced the term 'digital literacy' in 1997 without considering the other literacies mentioned above, even though it might be getting involved with other traditional literacies.

b. The Web of Science (WoS)

The Web of Science provides access to current and retrospective multidisciplinary information from approximately 8,700 of the high impact research journals. Web of Science also provides cited reference searching for forward or backward navigation. It is available through International Islamic University Malaysia (IIUM)'s online databases. Many bibliometricians or scholars also used this site. Thanks to WoS that provides such advanced system to do bibliometrics study. Therefore, the study can automatically do calculating and analysing the selected data.

3. RESEARCH METHODOLOGY

a. Research Design

A research design emerges from the purpose of the research questions, that is, what one wants to find out. This is manifested in the form of research questions (Puvenesvary, et al., 2008).

The quantitative method was used to analyse the selected data. The main purpose of the study is to identify the degree of author collaboration among scholars in digital literacy articles. In order to answer the research questions, it is necessary important to select relevant documents on this particular topic that will be explained in the subsequent section.

b. Population and Sampling

Population is generally a large number of individuals or objects that is the main focus of a scientific query. Population of the current study were all documents related to digital literacy topic gathered from WoS; articles, proceedings paper, editorial material, book review, review, and etc. that consist of total of 843 documents published from 1997 to 2013 and were written in variety languages.

Meanwhile, a sample is a small number of participants or objects selected from a large number of populations (Shah, et al., 2011). Due to there was a large difference between the number of documents in the form of articles with other documents, therefore this research will only take articles as a sample of study. Hence, the study only uses articles, in which consist of 661 articles and were written in English language published from 1997-2013.

c. Instruments

The Web of Science (WoS) was used to gather and analyse the selected documents. The WoS tool has been used by many researchers to do bibliometrics study. In order to arrange and analyse the selected data, it is necessary to provide worksheets from Microsoft Excel 2007. In turn, Microsoft Powerpoint was also precisely used to support the findings by providing variety graphs.

d. Data Collection Strategy

The Web of Science provides a tool that can help the study to get relevant data. The study used *"basic search"* on the Web of Science

interface retrieval tool. The following were the steps how to gather the relevant data:

1. Gathering all documents through the WoS site that was available through IIUM Library Online Databases, searching 'digital literacy' by '*topic*' at the right pull down option on its interface. The period of time was limited from 1997-2013 as seen in figure 2.

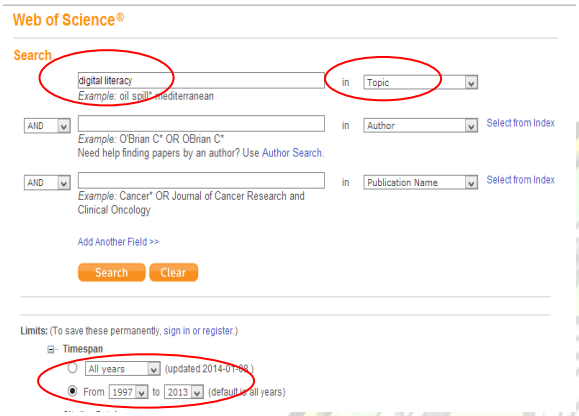

Figure 2. The WoS's interface retrieval tool

2. Print out the first page of total of 661 articles. It aims to surely identify whether the articles are either single-authored papers or multi-authored papers.
3. Once the data were gathered, Microsoft Excel worksheets are needed to arrange them accordingly. Besides, in conjunction with Microsoft Powerpoint, the study will provide graphs to clearly show the findings.

e. Data Analysis

In order to measure the degree of author collaboration in digital literacy topic, the Subramanyam's law was used. This formula is very simple to use. Many researchers used the same formula to measure the degree of author collaboration. First of all, the study needs to know how many articles were joint-papers and how many articles were single-authored papers. By putting the numbers into this simple formula, the degree of author collaboration will soon be known.

$$C = \frac{Nm}{Nm + Ns}$$

Note:

- C = degree of collaboration
- Nm = number of multiple-authored research papers in the discipline published during a year
- Ns = number of single-authored research papers in the discipline during the same year (Subramanyam, 1983)

4. DATA ANALYSIS AND FINDINGS

a. Data Analysis

RQ1: What are the authorship patterns in digital literacy?

It was found that as many as of 199 articles were written by two authors while of 214 articles were written by more than two authors. However, there were a significant number of single-authored papers that consisted of 248 articles (see table below). It is interesting to note that the highest number of authors can be found in the article of "*Policy Statement-Children, Adolescent, Substance Abuse, and the Media*", in which this article showed that 19 authors have contributed in this single article.

Table 1. Authorship patterns' worksheet

Year	Single Author	Two Authors	> Two Authors	Total
1997	3	1	1	5
1998	0	0	0	0
1999	3	1	0	4
2000	2	0	0	2
2001	1	2	1	4
2002	2	1	3	6

2003	8	2	4	14
2004	3	2	2	7
2005	8	2	9	19
2006	7	6	7	20
2007	7	8	8	23
2008	17	17	18	52
2009	24	17	11	52
2010	25	17	22	64
2011	39	35	32	106
2012	56	43	47	146
2013	43	45	49	137
TOTAL	**248**	**199**	**214**	**661**

Based on the Subramanyam's law, it was found that the degree of author collaboration in this subject was 0.623, indicating that 62.3% of the total articles were multi-authored papers. It can be said that the field of digital literacy has attracted people to be considered and they refered to work with in making the field more precisely, and it is probably the role of advanced technology today in which people have no limitation to share, knowledge, research, and carry on in anytime and anywhere.

Table 2 shows that as many as of 248 articles were single-authored papers while the rest were multi-authored papers of 413 articles. It also provides the trend of authorship pattern over the years. However, in 1998 there was no single article being published. The year 2000 shows that there were only two artcles being published and were single-authored papers, and it was the least number of articles has ever published about digital literacy.

Table 2. The degree of author collaboration

Year	Single Authored Papers	Multi-Authored Papers	Degree Of Collaboration
1997	3	2	0.4
1998	0	0	0
1999	3	1	0.25
2000	2	0	0
2001	1	3	0.75
2002	2	4	0.66
2003	8	6	0.42
2004	3	4	0.57
2005	8	11	0.57
2006	7	13	0.65
2007	7	16	0.69
2008	17	35	0.67
2009	24	28	0.53
2010	25	39	0.6
2011	39	67	0.63
2012	56	90	0.61
2013	43	94	0.68
TOTAL	**248**	**413**	**0.62**

RQ2: Who are the prolific authors in digital literacy?

The study found that as many as of 500 authors have joint in writing digital literacy articles published from 1997 to 2013. The most prominent author in digital literacy was Eszter Hargittai who published 8 papers in the five different journals. She is Delaney Family Professor in the Communication Studies Department and Faculty Associate of the Institute for Policy Research at the Northwestern University where recently she heads the Web Use project[1].

The second prominent author was Guy Merchant who wrote 6 articles. He is a professor of literacy in education, Research Excellence Framework (REF) co-ordinator and research lead for the Department of Teacher Education at Sheffield Hallam University. He specialises in research into digital literacy and is particularly interested in the inter-relations between children and young people, new technology and literacy2. The third one was Sonia Livingstone who published 5 articles. She is a full professor in the Department of Media and communications at the London School of Economics and Political Science and teaches master's courses in media and communications theory, methods, and audiences, and supervises doctoral students researching questions of audience, publics and users in the changing media landscape. Table 3 shows the top-10 authors

who published ≥ three articles in this particular subject

Table 3. The top-10 wise authors contributed in digital literacy area

No	Authors	Publications
1	Eszter Hargittai	8
2	Guy Merchant	6
3	Sonia Livingstone	5
4	Eileen Honan	4
5	Gloria E. Jacobs	4
6	Edward Alan Miller	4
7	Van Deursan Ajam	4
8	Van Dijk Jagm	4
9	Darrel M. West	4
10	David Bawden	3

R3: Where the more productive countries?

A total of 661 selected articles were spread in many areas all over the world. As many as of 54 countries wisely contributed to talk about digital literacy topic. The study has put them into five Continents as seen in figure 3. The America Continents, which is the most productive area, produced 47%, followed by Europe of 29%, Australia/Oceania of 11%), Asia of 8%, and Africa of 5%, respectively.

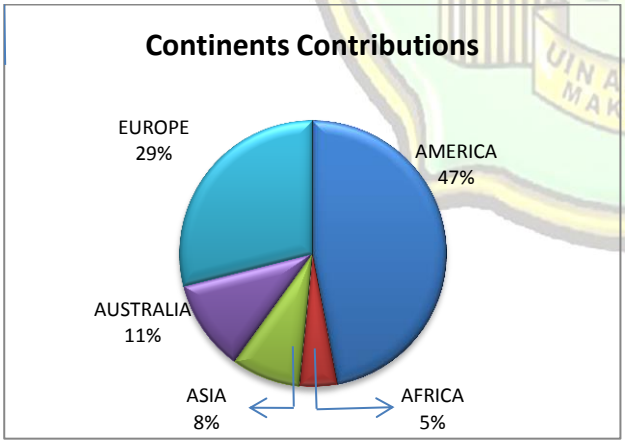

Figure 3. The scattering of 661 articles throughout the Continents

Table 4. Countries contribution in digital literacy

No	Countries	Publ.		NO	COUNTRIES	Publ.
1	USA	289		31	BRAZIL	2
2	UK	86		32	COLOMBIA	2
3	AUSTRALIA	76		33	CROATIA	2
4	CANADA	39		34	JAPAN	2
5	SPAIN	18		35	KENYA	2
6	NETHERLANDS	16		36	MALAYSIA	2
7	CHINA	16		37	PAKISTAN	2
8	SOUTH AFRICA	14		38	PORTUGAL	2
9	TAIWAN	13		39	SERBIA	2
10	GERMANY	12		40	SLOVENIA	2
11	NORWAY	12		41	SWITZERLAND	2
12	FINLAND	11		42	CYPRUS	1
13	SWEDEN	10		43	EGYPT	1
14	INDIA	7		44	HUNGARY	1
15	ISRAEL	7		45	IRELAND	1
16	BELGIUM	6		46	MOZAMBIQUE	1
17	BOTSWANA	5		47	NAMIBIA	1
18	GREECE	5		48	NIGER	1
19	ITALY	5		49	POLAND	1
20	NIGERIA	5		50	SAUDI ARABIA	1
21	SCOTLAND	5		51	SLOVAKIA	1
22	CHILE	4		52	SUDAN	1
23	FRANCE	4		53	SWAZILAND	1
24	MEXICO	4		54	TANZANIA	1
25	NEW ZEALAND	4			**TOTAL**	**688**
26	SINGAPORE	4				
27	TURKEY	4				
28	IRAN	3				
29	WALES	3				
30	AUSTRIA	2				

Table 4 depicts countries around the world that contributed to digital literacy. It is found that the USA was the most productive country in which it has created a total of 289 articles related to digital literacy. It is then followed by countries that published more than 30 articles; UK, Australia, and Canada respectively. The rest were the countries that published below 20 articles. In South-East Asia, Singapore and Malaysia have published a total of 6 articles in this particular topic.

However, there were several articles are joint-authors from different countries.

RQ4: Where the more productive institutions?

A total of 449 organizations/institutions have joint to participate in digital literacy topic. Table 5 shows the number of organizations/institutions that contribute in writing digital literacy articles. It is divided into two categories; academic and non-academic organizations/institutions.

Table 5. Organization/institutions contribution to digital literacy

Year	Academic Instituion	Non Academic Institution	Total
1997	4	1	6
1998	0	0	0
1999	3	1	4
2000	2	0	2
2001	1	2	3
2002	2	1	3
2003	8	2	10
2004	3	2	5
2005	8	2	10
2006	7	6	13
2007	7	8	15
2008	17	17	34
2009	24	17	41
2010	25	17	42
2011	39	35	74
2012	56	43	99
2013	45	43	86
TOTAL	**250**	**199**	**449**

Of the overall total, as many as 250 academic institutions have contributed their ideas or thoughts about digital literacy, while the rest are government or private agencies. The more productive institution was Open University that contributes a total of 13 publications about digital literacy. The table 6 lists the top-10 organizations that publish more than 6 articles in this particular subject.

Table 6. The top-10 institutions that published articles about digital literacy

NO	Organizations	RECORDS
1	Open University	13
2	University Illinois	13
3	Northwestern University	11
4	Monash University	10
5	Sheffield Hallam University	10
6	University North Carolina	9
7	Columbia University	8
8	University British Columbia	8
9	University Calif Berkeley	8
10	Deakin University	7

RQ5: Which are the more productive journals?

A total of 661 digital literacy articles were scattered in the total of 264 journals. The most productive journals that have published ≥ 10 articles were listed in the table 7. The Journal of Adolescent Adult Literacy was the most productive journal in which it has published 38 articles about digital literacy.

Table 7. The journals that published ≥ 10 articles

NO	Journals	Publ.
1	Journal Of Adolescent Adult Literacy	38
2	Reading Teacher	26
3	Computer Education	23
4	Comunicar	18
5	Literacy	17
6	Learning Media And Technology	16
7	Media International Australia	15
8	English Teaching Practice And Critique	13
9	Language And Education	12
10	Electronic Library	11
11	Journal Of Medical Internet Research	11
12	Library Trends	11
13	New Media	10

Meanwhile, in research areas, digital literacy topic has much be being considered in education fields, followed by library and

information sciences. It can be seen in the table 8. It is assumed that those individuals in educational field recognize that digital literacy is needed to be considered as an important area nowadays as its literacy tells student about the skills, knowledge, creativity and attitudes that are necessary to be able to use digital media for learning and mastering in the knowledge society.

Table 8. Research areas in digital literacy

No	WoS Categories	Publ.
1	Education Educational Research	320
2	Information Science Library Science	120
3	Communication	87
4	Linguistics	62
5	Language Linguistics	51
6	Computer Science Information Systems	40
7	Computer Science Interdisciplinary Applications	30
8	Health Care Sciences Services	29
9	Psychology Educational	26
10	Medical Informatics	20

b. Findings

The results of this bibliometrics study show that the degree of author collaboration was 0.62 (62%), indicating that more than a half of the total of 661 articles about digital literacy published from 1997-2013 were multi-authored papers. It might perhaps that individuals on this particular topic refered to work with other researchers. The highest number of authors can be seen in the article "*Policy Statement-Children, Adolescent, Substance Abuse, and the Media*", in which this single article consists of 19 authors who have participated in writing this article.

In terms of who are the prominent authors, Eszter Hargittai was the most famous writer on this particular subject who has written as many as 13 articles. She wass then followed by Guy Merchant and Sonia Livingstone who wrote 6 and 5 articles respectively. Meanwhile, the Americas showed a huge number of publications, in which nearly half of the total article can be found in this continent. In addition, European countries were also increasingly talk-active about digital literacy. However, in the Middle-East countries, individuals did not too pay attention on digital literacy.

Digital literacy was much being considered for those involved in educational matters. It can be seen that there was a large number of research publications in this area. It is perhaps, as mentioned earlier that probably digital literacy has become a part of curriculum in school class nowadays and indeed should be considered. It is therefore determined that digital literacy is becoming part of our life in today Google era and every individual around the world is supposed to be literally digital.

5. SUMMARY, CONCLUSION AND RECOMMENDATION

a. Summary of Study

The bibliometric study is one of important area in library and information science field. One of areas in this study is to measure the degree of author collaboration in certain fields. The current study focuses on digital literacy articles that were being indexed by the Web of Science's database that provided by IIUM Online Databases. The topic is indeed nowadays becoming a popular issue. It can be seen from the statistic provided early that there was an increasing number of publications about digital literacy over the years since the terms '*digital literacy*' was first introduced by Paul Gilster in 1997, and perhaps those publications will likely continue to increase in the subsequent years.

b. Conclusion

Research collaboration plays significant role for advancing knowledge. By working with

other individuals or organizations, one might produce valuable or better results from scientific endeavour effectively and efficiently. It is widely assumed that collaboration in research should be encouraged. Many studies have been discussed about the benefit of doing joint-research. It has been observed in this study that in digital literacy topic, in which individuals, organizations, and countries referred to work or share together to result scientific endeavours. Thank to today advanced technology that usefully help people to research with others cross-disciplines.

Each discipline has different level of degree of author collaboration (Subramanyam, 1983). There are disciplines that have a low level of joint-authors, others have a high level of collaboration. Indeed, collaboration might produce better results as mentioned before.

There will be opportunities to share knowledge, skills, and techniques of certain fields to others. Individuals can nowadays have different approaches to advance knowledge from any directions by doing joint-research.

One should consider that digital literacy is one of important areas in today environment and it should also be addressed as a part of information literacy as the root of any literacy. It is due to that based on the findings that not only from library and information science field has contributed in discussing about digital literacy, but other disciplines, such as from educational fields have proportionally studied in this particular topic.

c. Recommendation

Bibliometrics study has extensive applications in identifying the treans in certain fields. This brief research of bibliometrics is still far from perfect. What has been discovered here was only a general view of the trends that exist in digital literacy articles published from 1997-2013, particularly in degree of author collaboration. However, It is perhaps necessary to other researcers to further study in digital literacy such as its content or citation analysis, or dispersion of scientific literature in this particular topic.

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