

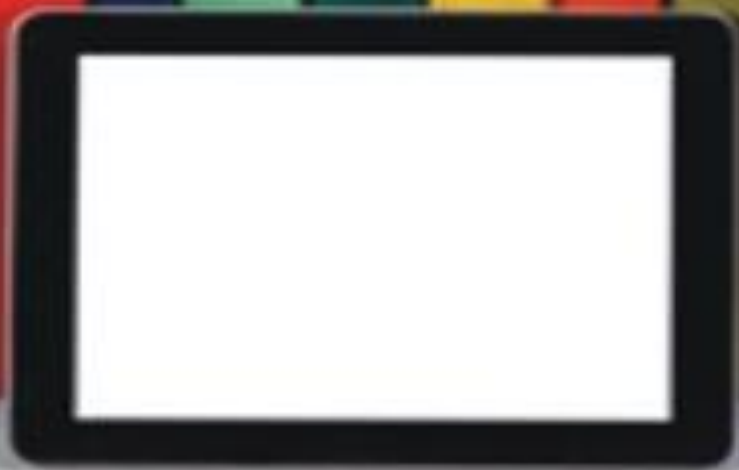
# International Journal of Library and Information Science

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*Full Length Research Paper*

## Development of bibliometrics in Colombia

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The literature on bibliometrics published by Colombian and foreign authors who selected Colombian academic journals or events held in the country to communicate their findings is analyzed. The publications by Colombian researchers published abroad were also collected and analyzed. The type of documents used by researchers, the journals most used, and the languages used for communicating their findings were also studied. The growth of the literature, the network of co-authorships, the more productive authors, and scientific fields most researched were also analyzed. It was found 255 papers were published in academic journals, most of them in Spanish language; 77% of authors have published just one document, while 23% of them made between 2 and 24 contributions. The production of this kind of literature is concentrated in the last decade as well as the collaboration behavior of authors. The literature is growing in an exponential form at a rate of 20% per year and doubling in size every 4 years. Network analysis identified six research groups in the country.

**Key words:** Bibliometrics, scientometrics, informetrics, Colombia, co-authorship.

### INTRODUCTION

The publication of a document is the materialization of the results of a research carried out by an individual or group of individuals in a given field of knowledge. The publication of a document allows a researcher's work be read, criticized and then cited by other scientists in the same field or associated areas. Before the publication of a document, a scientist may choose to present the results of his/her research in a national or international event looking for criticisms and comments from colleagues. These comments and criticisms can often help him/her to enrich some aspects of the paper (Fox, 1983), since scientific events (roundtables, seminars, meetings,

conferences) represent valuable opportunities to “share ideas and discoveries where the presentation of the progress of the research to the academic community of pairs follow the rigor expected for the legitimization of the form and content of scientific research findings” (Chan et al., 2007). Thus, scientific communication is a social process that allows the dissemination and exchange of information among scientists, since a scientist must submit his/her document to a review process by “blind peers”. This is the mechanism for evaluating documents for publication, adopted by academic journals.

Castro et al. (2009) suggest that “scientific publications

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play a role in the different stages of the research activity; they are the starting point of any inquiry, therefore, show the state of knowledge in a given subject, and are the preferred channels that announce the results of researches completed. It also helps spread knowledge, which will be the basis for further research of other scientists, so that the contributions of successive generations of researchers make possible the cumulative growth of science and, ultimately, scientific progress". Consequently, researchers through their publications directly contribute to development of a discipline in theoretical, practical and methodological aspects; therefore, for bibliometrics, publications have become the object of study (Mueller, 2007; Fox, 1983).

The idea of using published scientific literature as an object of study dates back to the mid-1930s when Wilson and Fred (1935) claimed that a census of publications in a given field could give valuable information to interpret past production and enough basis for predicting future trends. Hence data collected of the literature have been used as conventional tools for strategic planning, performance evaluations, and trends of scientific fields. This analysis is done through bibliometric techniques, an area of information science that was introduced in the scientific world in the early twentieth century, to study the published scientific literature and create productive performance indicators of a scientist. It is interested in knowing, with the use of mathematical models and applying descriptive and inferential statistics, what and how to publish, and how to characterize trends of the behavior of the scientific output of a field of knowledge (Mueller, 2007). Thus, it has become a technique that is applied not only by library information science professionals, but by psychologists, physicists, accountants, managers, etc. who are interested in measuring "levels of scientific production of a country, an institution, an author, or journal" (Ríos et al., 2011, p. 304), to find thematic trends, most productive authors, basic core of scientific journals, etc.

Bibliometrics is a discipline that is also being developed and applied in Colombia. For example, in 1999 the Colombian Observatory of Science and Technology was created with the purpose of reaching "the production of statistics and indicators, support strategic planning and decision-making processes through a comprehensive understanding of the dynamics of science, technology, and innovation -CTI- in the country, and its place at the regional and global levels" (Colombian Observatory of Science and Technology, 2012). Since its inception it has made extensive use of bibliometric techniques for technology monitoring and measuring the bibliographical productivity of Colombian scientists. The Colombian Observatory of Science and Technology institution annually publishes a text titled "Science and Technology Indicators" that includes various aspects of bibliographical production, investment in science, technology and innovation, and industrial property rights, among others. There are also professionals from various fields who

have studied and applied bibliometric techniques in different disciplines, but as far as it is known by the authors of this paper there is no research that have studied the development of bibliometrics, scientometrics, and informetrics field in Colombia, neither the application of these techniques in the country. For that reason, the purpose of this paper is to analyze the development of bibliometrics in Colombia, following up national or foreign authors who have made publications in journals and at national events, and to Colombian authors who have made publications in foreign journals or events using bibliometric techniques, i. e. the study of scientific production on Colombian bibliometrics. To date, this monitoring is absent in the applied sciences, pure sciences, social sciences and the humanities. This paper aims to fill up this void and open space for future exploration on this issue, especially by the importance that it has to characterize the national scientific production identifying trends on more productive authors, more productive journals and by this way contribute to understand the evolution and development of science in Colombia. For that reason, this article will describe and analyze the literature produced on bibliometrics in Colombia trying to answer the following questions:

What kind of document predominates in this production? What are the most often used journals to communicate the results of research? What are the languages chosen to disseminate the results of researches? What are the areas of knowledge where Colombian scientists are using bibliometric techniques? Who are the authors who are applying bibliometric techniques in the country? Who are the more productive authors? Do these authors collaborate with each other and are they forming networks? What are the more representative groups? What is the form of growth of this literature?

This paper seeks to answer these questions. To achieve this goal it is organized as follows: the first section gives a brief introduction to the research problem and asks the questions to be answered. In the second part we review the literature relevant to the issue. Then, we describe the methodology, the units of analysis, the form of data collection and form of measurement of data. Subsequently we provided the results and discuss their findings. Finally conclusions are presented and the literature reviewed in the writing of this paper is listed.

## LITERATURE REVIEW

Bibliometrics is a research line of library and information science which plays an important role in the analysis of scientific production in different areas of knowledge of a country. For example, its evolution and development in Brazil has been studied by Urbizagástegui (1984). Its incorporation as a research line at graduate programs in Brazil was analyzed by Araújo and Alvarenga (2011). The subjects studied and communicated through five Brazilian

academic journals in the field of information science covering the period from 1990 to 2005 and including geographical and chronological distribution were examined by Machado (2007). Also a historical analysis of the evolution and structure of bibliometrics can be read in Urbizagástegui (2007).

In Mexico no studies were found that specifically analyze the published literature on the application of bibliometric techniques, but there are studies that analyze the scientific production using these techniques in the fields of hydraulic engineering (Sola et al., 2011), psychology (Díaz et al., 2010; García et al., 2010), in agricultural sciences (Bravo et al., 2008), hypertension (Carrasco-Rico et al., 2004), and solid state physics (Ferreira et al., 1978).

Also in Peru some research has been done tracing the development of bibliometric applications in information science and librarianship by Chiroque Solano (2007), who show that between 2003 and 2007 there were only 13 documents. Similarly, Romani et al. (2011) examined the literature produced as lines of research in the biomedical science and they found only 21 papers published by Peruvian researchers. Recently Urbizagástegui (2012) conducted a more detailed research and found 124 research papers in different fields of science in general. These are examples of bibliometric applications in some countries of Latin America.

No studies that specifically analyze the literature on Bibliometrics, scientometrics or informetrics produced in Colombia were identified. However, several studies analyzes special areas of knowledge. For example, Guerrero (2007) analyzed the structure and dynamics of the articles published in the Colombian Journal of Sociology. González et al. (2011) studied articles published in the area of veterinary medicine and animal husbandry. The scientific production of infectious diseases was analyzed by Ríos et al. (2011); the Latin American scientific production in physical therapy by Vernaza-Pinzón and Álvarez-Bravo (2011); the scientific literature in clinical research and audiology by Hernández-Jaramillo, et al. (2010); the academic production in the field of Colombian psychology by López López et al. (2010). Analysis of work on multidisciplinary engineering was indexed in the database Web of Science by Rojas-Solas and San-Antonio-Gómez (2010). The impact of bibliographic production in science, technology and innovation was done between 1996 and 2005, by Castro et al. (2009). Reviews of the impact factor and its use in Colombia were done by Leon et al. (2007). Analysis of thesis programs and behavior modification therapy was conducted at universities in Bogotá by Rey and Santos (2005).

## METHODOLOGY

As units of analysis were taken papers published in academic

journals, papers were presented at congresses to address some of the aspects of bibliometrics or applying these techniques in any discipline or particular subfield. We excluded books, theses, monographs and gray literature mainly because these types of documents are not indexed in bibliographic databases and are not made available on the internet. We searched for documents published as articles, book chapters and papers presented at conferences or events, held in Colombia by Colombian or foreign authors. Likewise, we searched for publications of the same type (articles, book chapters and papers presented at conferences or events) by Colombian authors abroad. These documents were retrieved through text mining techniques on the web, using keywords such as Colombia, bibliometrics, informetrics, scientometrics, Lotka's law, Bradford's law, Zipf's law, Price index, Pratts' index, co-citation, citation analysis, social networks, h-index, visibility, growth of literature, impact factor, bibliographic coupling, immediacy factor, invisible colleges, epidemic theory, Goffman's transition point, Goffman's law, obsolescence of literature, half-life, elitism and research front, technological monitoring, evaluation of science, etc. in their multiple combinations. We also searched the catalog of the Library System of the University of Antioquia (Medellín, Colombia), since in this library are indexed national academic journals. Likewise, regional repositories as SciELO Brazil, SciELO Mexico, SciELO Venezuela, SciELO Colombia, SciELO Chile, SciELO Argentina, SciELO Bolivia, and Redalyc were searched. Also databases such as Web of Science, Scopus, Academic Search Complete, Springer, Agris, HAPI, Library Literature and Information Science Full Text, LISTA Library, Information Science and Technology Abstracts, and well as Google Scholar were searched.

To ensure a stable and manageable data collection, a special database with EndNote bibliographic management software (Version 5.0 for Windows) was created. In this database all information localized in the bibliographic databases mentioned above was entered. Subsequently, a close reading of each retrieved document was done, carefully analyzing the references of each publication. Each citation regarding the subject matter and produced by Colombian authors and/or foreign authors but published by journals in Colombia was faced with the database and incorporated on it if it had not been identified in the first search above. Through this careful reading of each identified document was produced a database containing references to journal articles, book chapters, and conference papers. These documents produced between 1982 and December 2012 constitutes the universe of this research. The period covered by the retrieved literature is large enough to expect some form of growth.

The analysis of the data collected was performed with the help of Microsoft Excel and SPSS (version 17.0 for Windows). With the help of these softwares the relevant descriptive and inferential statistics were made. To study the form of literature growth we used the nonlinear exponential equation proposed by Egghe and Ravichandra Rao (1992). This function is represented mathematically as:

$$C(t) = C(O)e^{at}$$

which can be rewritten as:

$$C(t) = c g^t$$

Where

C (t) denotes the total number of documents produced at time t; c and g represent constants estimated from the observed data and t is the number 0, 1, 2, ... n chronological years studied in the research time-span. In this equation,  $c \geq 0$ ,  $g \geq 1$  and  $t \geq 0$ .

To develop the co-authorship network in Colombian bibliometrics.



**Table 1.** Types of documents produced as languages.

Type of documents	Published in the country			Published abroad			Total
	Spanish	English	Portuguese	Spanish	English	French	
Articles	161	4	2	19	12		198
Papers in congresses	17			12	2		31
Book chapters	17			1	1	1	20
Letters to the editor	6						6
Total	201	4	2	32	15	1	255

BibExcel and Pajek tools were used. Bibexcel is a program developed for the administration and processing of bibliographic records. It allows the combination of information from different fields in a record, performs frequency counts, co-occurrences of authors, co-citations, and bibliographic coupling. Pajek is software for analysis and visualization of social networks, developed at the University of Ljubljana, Slovenia, by Vladimir Batagelj, Andrej Mrvar, with the contribution of Matjaž Zaveršnik. Both are public domain tools.

## FINDINGS

255 documents published in Colombia and in other countries by Colombian or foreign authors who chose Colombian journals or events to communicate their research findings were found. The predominant form of communication are papers published in academic journals (78%); then papers presented at national events (12 %); less frequent are book chapters (8%), and finally letters to the editors of academic journals (2%) (Table 1). It is remarkable the small number of documents published as conference papers and as book chapters. In the scientific communication process the natural cycle of a document is first to present it at an event, either nationally or internationally, seeking to disseminate the results of a research, and then get a criticism or suggestions of colleagues to improve the results of researches or add new issues not previously taken into account (Schenkel, 2008). Later this paper, with appropriate corrections, may become a scientific paper submitted for peer review in an academic journal and finally published. Later the publications in the form of articles may be converted to book chapters or books.

This high tendency of academic articles published among Colombian scientists was also observed by Castro et al. (2009) who found that in the Colombian basic sciences, science and health technology, marine sciences and agricultural sciences, production of scientific articles are predominant. In social science programs and scientific studies of education the publication more predominant is in the form of books and book chapters; but in the field of biotechnology, environment and habitat, electronics, telecommunications and information technology, energy and mining the participation in theses and degree, records of technological production, records of

industrial secrets and works of scientific or technological consulting area preferred. Also Russell (1998) studied the patterns of publishing of Mexican scientists and found that the journal article is the kind of document with many occurrences. Similarly, Silva et al. (2003) analyzed the scientific productivity of researchers in the field of humanities and social science in Brazil. They observed that the highest incidences of publications were articles published in national journals (26%), followed by papers published in national events (18%), and book chapters (16%). It seems that Colombian scientists working with bibliometric applications in different fields follow similar patterns. It is not in vain that the scientific paper is an exercise of articulation among established theories and recognized by the academy, through which the researcher seeks public dissemination of the outcome of their studies. By this way, the academic journal becomes "the main framework of the constitution and structure of the scientific communication, as it arose from the genuine needs of exchange of scientific experiences" (Weitzel, 2006, p. 52).

36% of the documents were primarily published in 13 national and 2 foreign journals. The national *Revista Interamericana de Bibliotecología* is the journal that has disseminated the major number of papers' on bibliometrics. The journals *Universitas Psychologica* and *Revista Latinoamericana de Psicología* are the journals next preferred by authors. To publish abroad Colombian researchers have preferred Mexico through the journal *Investigación Bibliotecológica* and Netherlands through the journal *Scientometrics* (Table 2). The communication of 64% of remaining documents was through journals that had published between 1 and 2 documents.

Naturally the leading language of publications is Spanish (91%); to a lesser extent English (7.5%), Portuguese (0.8%), and finally French (0.4%). Predominance of Spanish is natural because the publications are in Colombia where the official language is Spanish. Possibly authors who published in English are looking for ways to make sure visibility of their research in a global environment; or perhaps the authors are doing graduate studies in English-speaking countries, which facilitates a collaborative publication of papers with teachers or thesis advisors in journals published in those countries. It is noteworthy to find 4 articles published in English in

**Table 2.** Principal academic journals.

<b>Journal titles</b>	<b>No. of papers</b>
Revista Interamericana de Bibliotecología	17
Revista Latinoamericana de Psicología	16
Universitas Psychologica	13
Scientometrics	6
Investigación bibliotecológica	5
Acta Biológica Colombiana	4
Acta Colombiana de Psicología	4
Avances en Psicología Latinoamericana	4
Ingeniería e Investigación	4
Revista Colombiana de Psicología	4
Innovar	3
Colombia Médica	3
Revista de Salud Pública	3
Revista MVZ Córdoba	3
Universitas Scientiarum	3

Colombian journals in collaboration between Colombian and Spanish authors. Probably these articles are looking for increasing visibility of journals and authors (Rojas-Solas and San-Antonio-Gómez, 2010), seeking to get a fair visibility of the national scientific production (Miranda, 1998).

Bibliometric documents produced by Colombian authors are published mainly at the national level. A still insignificant group has published their research abroad in countries like Holland, Mexico, Spain, Venezuela, Brazil, United States, England and Peru. Of the 386 authors identified in this research, few are foreigners who have sought to publish in Colombian journals or events: 13% are Spanish, 3% are Americans, 2% are Argentineans, Brazilians, French's and Mexicans; 1% are Venezuelans; 0.7% are Chileans, while Cubans, Dutchs, Puerto Ricans and Peruvians do not exceed 0.4%. In other words, the Colombian national space of publishing attracts about one-third of foreign authors.

The collaboration of authors has been preferably with authors from U.S., France, Holland and Peru; the results of these collaborations have not been communicated by Colombian publications, but through academic journals in these countries. The fact that most of the documents were published in Colombia and in Spanish (the language of the researcher) suggests publication facilities granted by formal communication channels of the institutions where authors are active researchers and an apparent difficulty in writing in other languages. These factors seem to contribute to select publications as local only. In this regard it is suggested that "the trend observed by scientists in the areas of humanities and social sciences [by] publishing more often within the country and in their own language is due in part to the very object of study in those areas" (Velho, 1997). This is the case of the Colombian bibliometrics.

Table 3 shows the type of publication according to areas of knowledge. The area with the largest number of papers published is library science with 38% and psychology with 24% of publications. Both areas agglutinate 62% of published documents. Then follow medicine (9%), management (5%), education and biology (4%). Disciplines such as economics, engineering, public health and sociology represent only 10% of all published documents. It is also striking that history (0.39%) is the only human science discipline making bibliometric applications. According to these findings, it seems that bibliometric techniques still do not attract the attention of researchers in the humanities, neither of the natural sciences researchers, since it was found only 2% of documents in physics and chemistry. This is noteworthy, especially because bibliometric models have been applied mainly in areas of the natural sciences. For example, Bradford's law was first applied in chemistry and geology (Bradford, 1934), Lotka's law in physics (Lotka, 1926), the Hirsch index or index of visibility in physics (Hirsch, 2005), and the list goes on with many other examples.

Table 4 shows the number of contributions by authors. There were identified a total of 386 different authors publishing in this field. Most of authors (77%) have published just one document, while 19% of them made between 2 and 4 contributions; 15 authors (4%) the major contributors, made between 5 to 24 contributions. The average is 0.7 publications by author, the mode being one document.

Table 5 shows the stratified categorization of authors producing publications using bibliometric techniques in Colombia. 77% of the authors were categorized as one-timers, meaning that in the period have published just one document. Very few of these authors will persist with bibliometric research and probably they will transfer their

**Table 3.** Areas of knowledge studied by type of publications.

Areas	Papers in book			Total
	Papers	Congresses	Chapters	
Librarianship	61	22	14	97
Psychology	57	--	3	60
Medicine	22	2	--	24
Management	13	1	--	14
Education	10	1	--	11
Biology	11	--	--	11
Economics	6	1	--	7
Engineering	4	2	--	6
Sociology	4	1	--	5
Public Health	4	--	--	4
Social Sciences	1	--	3	4
Political Sciences	2	--	--	2
Veterinary/Zoology	2	--	--	2
Physics	2	--	--	2
Agriculture	--	1	--	1
Environmental Sciences	1	--	--	1
Natural Sciences	1	--	--	1
Communications	1	--	--	1
History	1	--	--	1
Chemistry	1	--	--	1
Total	204	31	20	255

**Table 4.** Frequency of contributions by author.

No. of contributions	No. of authors	Percentage of authors
1	298	77.2
2	45	11.7
3	16	4.2
4	12	3.1
5	7	1.8
6	2	0.5
7	1	0.26
8	1	0.26
10	1	0.26
11	1	0.26
12	1	0.26
24	1	0.26
Total	386	100.0

**Table 5.** Stratified categorization of authors' productivity.

Category	No. of authors	% of publications	Average of productivity
Continuants	6	1.6	9.2
Newcomers	24	6.2	5.1
Transients	20	5.2	3.5
Terminators	38	9.8	1.6
One-timers	298	77.2	1.0
Total	386	100.0	0.7

**Table 6.** Number of documents produced according to number of authors.

Number of documents with 1, 2, 3 ... n authors									
Period	1	2	3	4	5	6	7	8	Total
1981-1984	2	--	--	--	--	--	--	--	2
1985-1988	1	---	--	--	--	--	--	--	1
1989-1992	2	--	--	2	--	--	--	--	4
1993-1996	5	1	1	1	--	--	--	--	8
1997-2000	10	4	2	1	--	--	--	--	17
2001-2004	12	7	7	1	2	--	--	--	29
2005-2008	23	26	15	6	4	2	1	1	78
2009-2012	32	35	21	17	5	3	2	1	116
Total	87	73	46	28	11	5	3	2	255

interests to other fields. Nearly 10 % of researchers were categorized as terminators, i. e. they are leaving the field because they have not made publications in the last three years. Transient researchers (5%) have published two papers scattered sporadically between nonconsecutive periods of more than four years. Very few of these authors will become moderate and still less large producers. The newcomer authors represent 6% of the researchers and are those who have published at least two papers only in the last three years. Because these authors are exploring the area, few of them will also persist in this field. Nearly 2% are continuant authors; they will persist in searching and producing papers in this field, because they are already established as authors in the area and with a high average of productivity.

These findings are consistent with statement of David (1994, p. 8) in the sense that “the distribution of scientific production is skewed, because most of the articles published in an area of research is the work of a minority group of scientists with a high [academic] profile”. This bias can apparently be explained by the notion of cultural capital and symbolic capital possessed by the authors and their dominant position in a scientific field (Bourdieu, 2008). For example, the most productive author is a professor at a Colombian university, which ensures familiarity with the matrices that enable the coding and decoding of the doxa of the field. For the moderate producers, 1 of the 3 authors is a coordinator of the research on bibliometrics of the Colombian Observatory of Science and Technology.

**Table 6** shows the documents produced according to number of authors. It attempts to show whether the research in Colombia was in collaboration and if such collaboration continues a growth tendency. For this reason the data were grouped by five year periods. 34% of the documents were published by a single author, i. e. without collaboration. Papers published in collaboration by two authors represent 29%; the documents published by three authors 18%; and papers published by four authors represent 11%. Documents published by five authors made a total of 21 documents representing 8% of

the total. Since its inception in 1981 to 1992, bibliometric applications in Colombia were an isolated and personal activity. Between 1993 and 1996, only 3 documents were produced in collaboration by 2, 3 and 4 authors. This trend increases to 7 documents produced in partnership between 1997 and 2000. Yet most are published by single authors. However, collaboration begins to increase as 4 documents are produced together by two authors, 2 document by three authors and 1 by four authors.

From 2001 to 2004, co-authorship begins to grow; of 29 papers published, almost over half of them (17 documents) were in collaboration. Seven documents were produced by three authors, one paper by four, and two by five authors. The real collaboration begins from the period 2005 to 2008, because 55 documents were published in collaboration between two and eight authors. In the period of 2009-2012 the same trend continues; from a total of 116 papers, 84 were carried out in collaboration between two and up to eight authors. In the last two periods collaboration between 2, 3 and 4 authors for research and publication of bibliometric applications in Colombia has been very common. It is stated by that in the social sciences there is little collaboration and that collaboration occurs more in the hard sciences. If these claims were true, results shown here could show that Colombian bibliometrics is closer to the hard sciences than to the social sciences. Coinciding with Patel (1973) we consider that the complexity of the problems a discipline may face, leads to a process of differentiation that is accompanied by a specialization. Academic specialization helps the researcher survive in this world of competition and differentiation. So the academic invests his/hers skills and his/hers resources in areas that offer some guarantee of recognition and visibility. Therefore, collaboration is the indicator of an evolving process pursuing differentiation and specialization, through which a discipline is reconstructed and equilibrated. As in most scientific fields fewer people know enough to work and write solitarily, in an isolated way, collaboration is a natural maturation process of science, looking for “work towards a common goal and sharing knowledge gained”

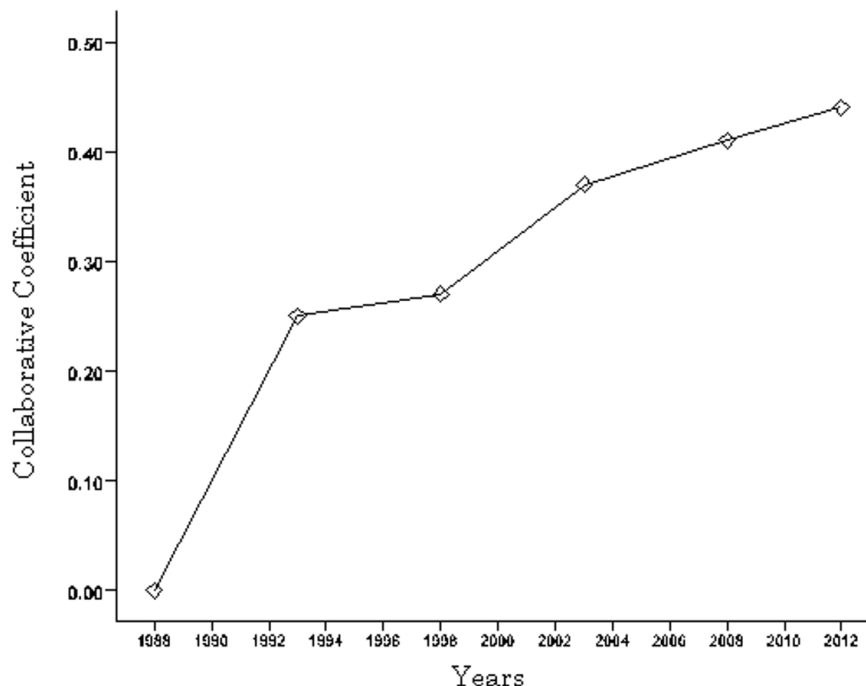


Figure 1. Coefficient of collaboration.

Table 7. Publications by 4 years period

Years	No. of publications	Percentage
1981-1984	2	0.8
1985-1988	1	0.4
1989-1992	4	1.6
1993-1996	8	3.1
1997-2000	17	8.7
2001-2004	29	6.7
2005-2008	78	30.6
2009-2012	116	45.5
Total	255	100.0

(Hara et al., 2003, p. 853). This process seems to happen in Colombia. It is enough to see Figure 1 to reconfirm the growth of collaboration between authors in publications measured through the coefficient of collaboration modified by Savanur and Srikanth (2010).

Table 7 shows the number of publications in Colombia bibliometric applications organized in periods of four years in order to show the growth of publications. In the first four years (1981-1984) only two works were published. Here is highlighted the first bibliometric application made by Leon (1982) and a practical application of the Bradford's law in an academic library by Ochoa de Ortiz (1984). Since its original formulation in 1934 by Bradford (1934), 50 years had to pass for Bradford's law began to be applied and used in

Colombia. In the four year period from 1989 to 1992 there is a slight increase of almost a doubling of documents with respect to the earlier four year period. This doubling of the volume of publications continues in the next four years period until reaching the 1997-2000 period with a slight increase of the half of the previous period. This increase may be due to the appearance of the Colombian Observatory of Science and Technology, which was founded in 1999. Despite the emergence of such institutions in Colombia, interest in using bibliometric techniques has been somewhat slow; for example, Lotka's law was applied only in 2004 (Restrepo, 2004) and in 2006 (Villegas-Echevarría; Moreno, 2006). This bibliometric law appeared first published in 1926 by Alfred Lotka; 78 years had to pass for this bibliometric law to get the attention of Colombian authors. In the last two periods the increase of publications is notable and 76% of all papers were published until 2012. This may be due not only to the establishment of the Colombian Observatory of Science and Technology, but also to the introduction of a policy of evaluation and productivity indicators as well as formalization of bibliometrics, scientometrics and informetrics courses and its usefulness in monitoring technology in the Colombian universities.

Regarding growth of bibliometric applications in Colombia, Figure 2 shows how the number of publications on this issue grows with small fluctuations until 2003 indicating that to that date there is a limited growth; that is, publications are sporadic.



Figure 2. Documents produced on Colombian bibliometrics.

From 2003 onward there was a growth of publications to reach its peak in 2010. Also there is a small decrease in 2011 and a fall in 2012. This may be due to several factors: the databases may have not indexed the articles published in the last months of the year; the journals are in process of publishing or there is not a proper distribution of publications, since the documents are not in the web or in the bibliographic databases searched. The graph shows only the jobs that were available in the sources used at this work to collect data until December 2012.

Figure 3 shows the observed and estimated cumulative number of papers published from 1982 to December 2012. Literature growth approaches to an exponential form with initial concave part to grow gradually as time increases according the years.

To estimate the fit of this model the exponential mathematical equation proposed by Egghe and Rao (1992), the nonlinear regression method, was used. An adjusted  $R^2$  equal to 0.993 was estimated, indicating a good fit of the data to the exponential model at 0.01 significance level. The estimated value of  $c$  was 1.092 with a standard error of 0.136. The estimated value of  $g$  was equal to 1.200 and a standard error of 0.006. Once these values are known we can set an equation that predicts the exponential growth of these publications as:

$$C(t) = 1.092 \times 1.200^t$$

This means that Colombian bibliometric applications are growing at a rate of 20% per year. To find the doubling time the following equation was used:

$$(1.200)^n = 2.0$$

Taking logarithms of both sides of the equation yields:

$$n(\log 1.200) = \log 2.0$$

$$n = \frac{\log 2.0}{\log 1.200}$$

$$n = \frac{0.69315}{0.18232}$$

$$n = 3.8$$

Publications using bibliometric techniques in Colombia are doubling every 3.8 years, more or less every 4 years. This literature is growing very rapid, as much as it does physics or chemistry in the United States.

Figure 4 shows the network of co-authors. This network shows six research groups. The first consists of 11 authors with outstanding performance of López López Wilson; Silva, Luis Manuel and Aguilar Bustamante, Maria Constanza. The authors of this group have in common that they are university professors in the field of psychology. From this group comes another two subgroups. The first is formed by Gomez Morales, Yuri Jack; Guerrero Castro, Javier Enrique and Jaraba Barrios, Andres Bruno, who belong to the research group of social studies of science, technology and medicine.

The second subgroup consists of Quevedo Blasco, Raúl and Buella Casal, Gualberto, who are psychologists and professors of the University of Granada in Spain. The second group consists of 6 authors, of which Orozco Castro, Luis Antonio; Chavarro Bohórquez, Diego Andrés

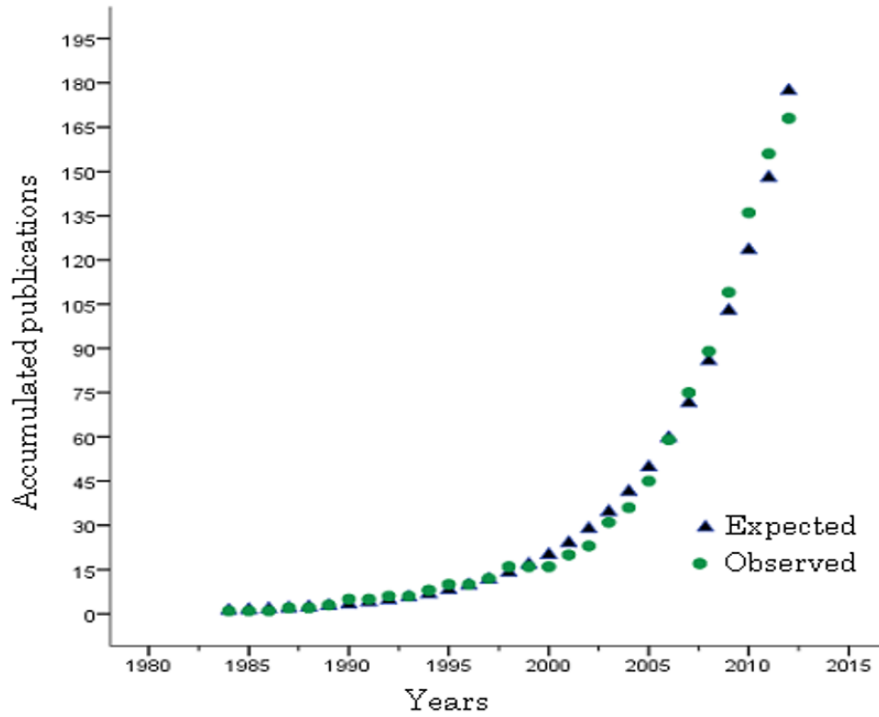


Figure 3. Growth of literature on Colombian bibliometrics.

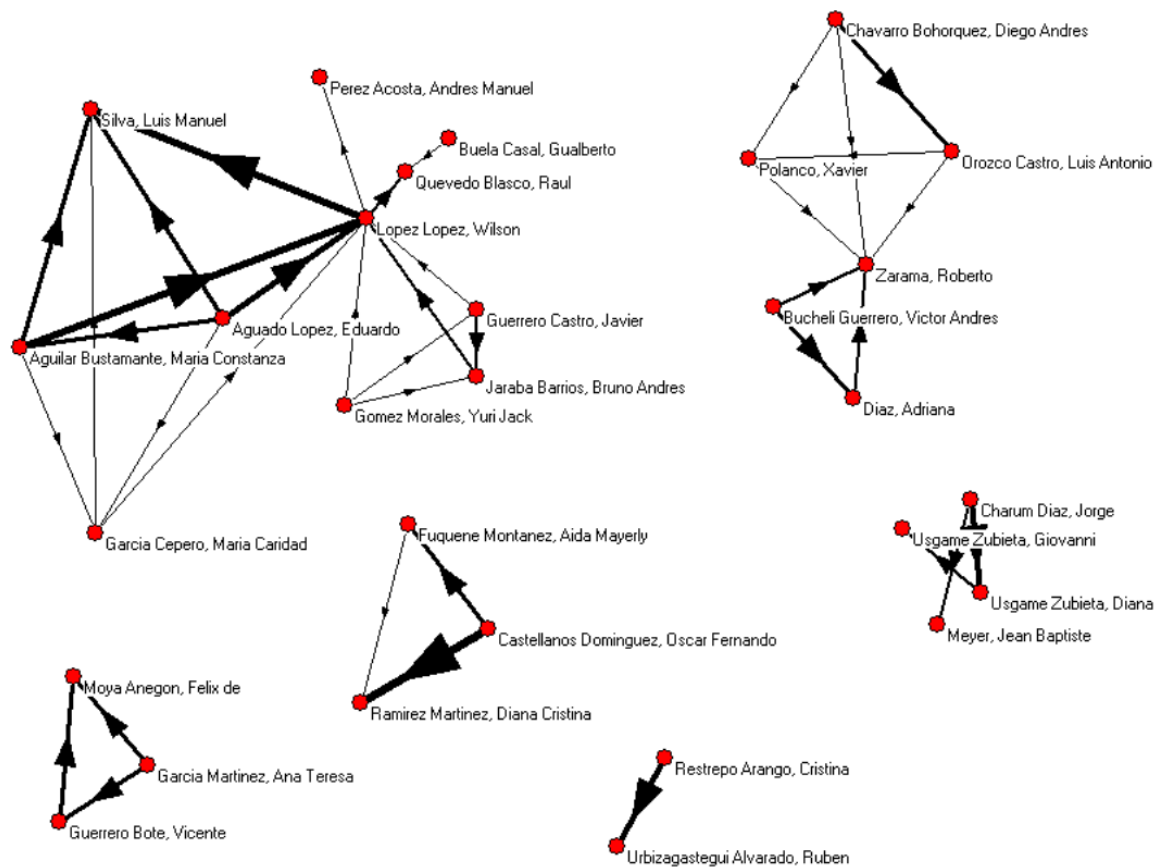


Figure 4. Network of co-authors on Colombian bibliometrics.

and Bucheli Bohórquez, Víctor Andrés are bachelors in engineering and are part of the research group on research management. The third group consists of 4 authors who have in common be part of the Colombian Observatory of Science and Technology, of which Usgame Zubieta, Zubieta Usgame Diana and Giovanni are graduates from the school of library and information science at the Pontificia Universidad Javeriana, where Usgame Zubieta, Diana is a teacher.

The fourth group consists of three authors who belong to the group of research and development in management, productivity and competitiveness. These authors are Fuqueñe Montañez, Aida Mayerly; Castellanos Domínguez, Óscar Fernando; and Ramírez Martínez, Diana Cristina, who are engineers and teachers. Furthermore, two of the authors are director and editorial coordinator of the journal *Ingeniería e Investigación*.

The fifth group consists of three Spanish authors; two of them are professors at the University of Extremadura (Guerrero Bote, Vicente and García Martínez, Ana Teresa). Moya Anegón, Félix is a professor and researcher at the University of Granada. The sixth group consists of two authors Urbizagástegui Alvarado, Rubén and Restrepo Arango, Cristina who are librarians working in academic libraries.

## Conclusion

The purpose of this paper was to analyze the literature produced on bibliometrics published in Colombia by national or foreign authors who selected Colombian journals or events in the country to communicate the results of their investigations as well as Colombian researchers who as individual authors or in collaboration published their researches in journals or events held abroad. It was found that Colombian bibliometric applications began with the work of León (1982) and a practical application of the Bradford's law in an academic library by Ochoa de Ortiz (1984). Although an initial sporadic publication on bibliometrics were observed, research on this issue takes force from 2004 ahead, but 60% of this production is concentrated in the last period (2007-2012) analyzed.

This literature is growing at an annual rate of 20% doubling in size every four years. Research is stratified focusing on four authors considered moderate and large producers and accounting for nearly one-fifth of the total production of documents. These authors published mostly in Spanish and very rarely in English. The journals used to communicate the results of their research are six domestic journals and they accounts for 32% of everything produced on the subject.

It was also found that collaborative publishing is a recent phenomenon, which has steadily increased since 1998. The areas explored are library and information science, psychology, and applied science and technology, which account for 95% of the papers published. This area

is dominated by authors from those fields.

## Conflict of Interests

The authors have not declared any conflict of interests.

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*Full Length Research Paper*

# Enhancing intellectual productivity through copyright: A survey of tertiary institutions in Niger State, Nigeria

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The paper examined copyright as an enhancing tool for intellectual productivity in tertiary institutions in Niger State, Nigeria. The research design used is survey. Purposive (judgemental) sampling technique was used to select seven (7) out of 12 higher institutions of learning that are in Niger State. The institutions selected were picked on the basis of: their relevance to the study; students' population; and years of establishment. The researchers used two (2) self-designed questionnaire instruments tagged "Enhancing intellectual productivity" to collect data for the study. The first instrument tagged "Enhancing intellectual productivity O" was administered to forty (40) copyright owners while the second instrument tagged "Enhancing intellectual productivity S" was administered to 700 students in the selected institutions. Statistical Package for Social Science (SPSS) was used to analyse the collected data. Part of the findings of the research is that violation of copyright through photocopying was more pronounced among the students in lower classes in all the institutions studied. Moreover, copyright holders are lopsided in the senior lectureship positions than in any other academic positions in the surveyed institutions. Moreover, 74.4% of the copyright holders affirmed that their work were involved in copyright abuse and that their work have suffered low sale due to illegal reprography in form of photocopying between 2009 and 2014. The study concluded that if properly handled, copyright would enhance intellectual productivity among right owners, researchers and inventors in higher institutions of learning and similar academic/ vocational organizations in Niger State and in Nigeria at large. It is recommended amongst other that intellectual property law should be made a core course in all higher institution in Nigeria and that all operators of photocopying centres should be made to open register for all photocopied items for adequate financial compensation to right owners.

**Key words:** Copyright, intellectual productivity, tertiary institutions, Niger State, Nigeria.

## INTRODUCTION

Intellectual productivity otherwise known as research productivity or intellectual property or publications output

could be described as the fruit of academic ingenuity that are produced in the academia from time to time and over

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a given period of time (Buttlar, 1991). Intellectual productivity (property) includes the following amongst others: literary work; invention; all intellectual activity in the industrial, scientific and artistic fields. Intellectual productivity is usually protected like any other property. Owners (holders) of intellectual property would do everything possible to ensure that their inalienable rights to their property are secured from all forms of infringement, abuse or theft. Protection of intellectual productivity remains the strongest antidote to its robbery or infringement. It is imperative to employ all the legal machineries to protect intellectual productivity from unauthorized users.

The exclusive legal right granted to an author, composer or artist with regard to the use, reproduction and exploitation of his created work is referred to as copyright. Fabunmi (2007) defined it as the law that gives the owner of a document, musical composition, book or other pieces of information right to decide what others can do with it. The "copyright" has three possible connotations. First, it suggests the right that a person has over the physical copy of his work. This was true in earlier times when the author of a work exercised effective control over his physical manuscript. The second idea conveyed is the right to copy. That is, the right the owner of a work has to make copies of his work. The third connotation is the requirement that a work must be copied "right". This suggests a license to copy on the condition that the copying would be done in a manner prescribed or permitted by law, leaving the copyright owner to a right to be remunerated (Asein, 2012).

World Intellectual Property Organisation (1986) described copyright as the exclusive right granted by law to the author of a work to disclose it as his own creation, to reproduce it and distribute or disseminate it to the public in any manner or by any means and also to authorise others to use the work in specified ways. Copyright has been described as property in which an action to restrain the infringement of a right of property will lie even if no damage can be shown. Copyrighted materials retain their value in spite of their exploitation and accessibility to the consuming public. Unlike other assets that diminish with use, copyright is not necessarily adversely affected by repeated use. In fact, the commercial value of the work may appreciate as a result of its being frequently used. For instance, the commercial value of a published novel stands a good chance of appreciating as the readership increases (Asein, 2012).

It is a legal means of protecting an author's work. It is a type of intellectual property that provides exclusive publication, distribution and usage rights for the author. This means whatever content the author created cannot be used or published by anyone else without the consent of the author. The length of copyright protection may vary from country to country, but it usually lasts for the life of the author plus 50 to 100 years. Many different types of content can be protected by copyright. Examples include

books, poems, plays, songs, films and artwork. In modern times, copyright protection has been extended to websites and other online content. Therefore, any original content published on the web is protected by copyright law. This is important in the digital age we live in, since large amounts of content can be easily copied and pasted. Copyright provides a helpful means of protecting original content. It serves to give people credit for the work they do, which is something we can all appreciate.

Literary works, musical, aesthetic works, cinematography film, sound recordings and broadcasting are the recognized categories of works eligible for copyright (Ayanyemi, 2007). Summarily, copyright can be referred to as the protection that covers published and unpublished works that can be seen, heard or touched. Copyright is an incentive for authors to create new works. Copyright can be defined as the monopoly rights granted to authors and creators in order to make sure that adequate returns are made from their work so as to encourage that creation of further intellectual works. The socio-economic development of a country depends on a large extent on the creativity of her people and creative works cannot be encouraged without effective administration of copyright laws. In Nigeria, copyright laws are not effectively administered. This is the reason why notation of copyright laws still persists. This manifests in forms of plagiarism, photocopying and piracy.

One of the major avenues through which copyrighted materials are violated in Nigeria is photocopying. Photocopying puts succinctly is the making of copies by photographic process (Mason, 1968). It is negative or positive photographic reproduction of graphic matter (Webster's Third New International Dictionary of English Language, 1986). It could also be viewed as an adaptation of photography whereby copies can be produced directly from the originals without need for re-creation of the image, for instance a master for subsequent reproduction (Nganga, 1984).

The photographic copying of books and other materials is a modern technique that started at the beginning of 20<sup>th</sup> century. Since then, photocopying has remained the most popular technique of document reproduction. It has been of tremendous value to education and dissemination of information and documentation centres, archives, higher educational institutions, commercial enterprises, government and non-governmental organisations and so on. Photocopying services are not designed to compete or replace duplicating processes, but to complement its services through direct reproduction of documents. Photocopying services are very useful in copying from materials that are suitable for direct reproduction. These materials include published materials like thesis, dissertation, lecture notes, drawings, letters and certificates to mention but a few. The photocopying service no doubt is very popular among scholars because it makes it possible for them to have positive copies of any material conveniently thereby saving them from the problem of

having laboriously copy by hand what they need whenever they visit the library.

In spite of the usefulness of photocopying, authors and publishers have argued that photocopying poses a threat to the development and free flow of information. Photocopying could serve as disincentive to further productivity on the part of right holders (authors and publishers) especially where the concept of "fair use" is violated. The concept of "fair use" permits the use of about 10 per cent of the copyrighted works for such purposes of criticism, comment, teaching and research without permission of the copyright owners. However, the laborious nature of photocopying activities that take place in Nigeria especially in higher institutions of learning could stifle productivity if not properly checked. Illegal photocopying in higher institutions of learning in Nigeria could only be checked through adequate enforcement of copyright. Copyright enforcement against illegal photocopying has the propensity of accentuating intellectual productivity. This is because if the right holders are sure that their works would not be copied or infringed upon by other people or group of people they are most likely to be encouraged to embark on further production of intellectual work. They are most likely to be motivated to embark on further productivity since they are sure that the more they produce the more income they are most likely to have all things being equal.

As the realisation of economic development of any nation would be a mirage without strict control of economic pirates, so also would the enhancement of intellectual productivity results in an exercise in futility without strict control of intellectual pirates. It is a known fact that intellectual pirates stifle creativity, novelty and innovation. There is no producer (creator) of intellectual property who would be willing to embark on more productive ventures if he/she knows that there are pirates somewhere who would circumvent his effort and make undue profits from his fruit of labour and vice versa.

Copyright would under normal circumstances engender intellectual productivity, industry, creativity and profitability. If there is full protection for any intellectual property, the owner of such property would under normal circumstances be encouraged to work hard to produce more so as to get more profit from their fruit of labour. It is a known fact that intellectual pirates wreak havoc on copyrighted works in Nigeria and across the globe. The nefarious activities of intellectual pirates in Nigeria and globally are sources of serious concern to holders of copyrighted work as they serve as serious disincentive to intellectual productivity. It is hoped that if copyrighted works are protected from all forms of abuses, the owners of such works are most likely to be encouraged to embark on further productivity. Higher institutions of learning were so selected simply because photocopying of materials is not only popular but has become the norm among scholars in higher institutions of learning across the globe (Menziner, 1980; Taylor, 1988). Moreover, all

the higher institutions of learning in Nigeria are littered with photocopying centres where all forms of legal and illegal reproduction of copyrighted materials take place every moment. In higher institutions in Nigeria, copyright holders are most likely to be encouraged to embark on further production of intellectual work if such copyright abuse especially in form of photocopying is stemmed if not completely eradicated. The paper therefore examined how intellectual productivity could receive a boost through copyright protection in tertiary institutions in Niger State, Nigeria.

### **Statement of the problem**

It is a known fact that most of the higher institutions of learning in Nigeria are citadels where uncontrollable piracy on copyrighted works thrive (Igbeneghu, 2009). The commonest means of piracy on campuses is photocopying. On most occasions the whole text is photocopied or a substantial part of a text is photocopied. The cost of photocopying a whole text is usually very small compared with the price of the real text. Many people especially students would prefer to photocopy textbooks rather than buying them. Such duplication of texts are usually done at the expense of real owners of the materials. The economic, social, moral and psychological rights of the owners of such works are therefore usually overturned by the activities of pirates. Piracy of the intellectual property serves as disincentive to further productivity if not properly checked. The paper therefore, examined how intellectual productivity could be enhanced in tertiary institutions in Niger State, Nigeria through copyright.

### **Objectives of the study**

The main objective of the study is to examine how intellectual productivity could be enhanced in tertiary institutions in Niger State, Nigeria through copyright. The specific objectives are to:

1. Determine the volume of copyrighted materials that are involved in abuse through photocopying in tertiary institutions in Niger State, Nigeria.
2. Find out the number of copyright owners whose works have suffered from copyright abuse through photocopying in tertiary institutions in Niger State, Nigeria.
3. Ascertain the extent to which the sales of copyrighted materials have been affected due to abuse through photocopying in tertiary institutions in Niger State, Nigeria.

### **Research Questions**

To achieve the foregoing objectives, the following

Table 1. Response rate.

	Name of institutions	Categories of respondents	Copies of instrument administered	Copies of instrument retrieved	Percentage (%)
1	Federal University of Technology, Minna. (FUT)	Students	150	120	80
		Copyright Owners	10	7	70
2	Ibrahim Badamasi Babangida University, Lapai. (IBBU)	Students	100	90	90
		Copyright Owners	5	5	100
3	Federal Polytechnic, Bida. (FPB)	Students	100	80	80
		Copyright Owners	5	4	80
4	Niger State Polytechnic, Zungeru. (NPZ)	Students	100	90	90
		Copyright Owners	5	5	100
5	Federal College of Education, Kotangora. (FCE)	Students	100	70	70
		Copyright Owners	5	4	80
6	Niger State College of Education, Minna. (COE)	Students	100	90	90
		Copyright Owners	5	4	80
7	College of Wildlife, New Bussa. (CWL)	Students	50	30	60
		Copyright Owners	5	3	60
Total		Students	700	570	81.4
		Copyright owners	40	32	80

research questions were asked and answered.

1. What is the volume of copyrighted materials that are involved in abuse through photocopying in tertiary institutions in Niger State, Nigeria?
2. How many copyright owners whose works have suffered from abuse?
3. To what extent does copyright abuse affect the sales of copyrighted materials?

### Scope of study

Babalola et al. (2013) listed 12 higher institutions in Niger State. The researchers adopted purposive (judgemental) sampling technique to select seven (7) out of the 12 higher institutions of learning for the study. The institutions selected are: Federal University of Technology, Minna; Ibrahim Badamasi Babangida University, Lapai; Federal College of Education, Kotangora; Niger State College of Education, Minna; Federal Polytechnic, Zungeru; College of Wildlife, New Bussa. The institutions were carefully selected for the following reasons. One, they are old institutions and there is no information that could be received in the other institutions which the selected institutions would not supply. Moreover, the depth of the academic activities that take place in the selected institutions is more than the ones that are not selected. The selected institutions also have more students

population than the ones that are not selected. The institutions selected are, therefore, selected for the afore-stated reasons. The study covers the level of abuse on copyrighted materials in the selected institutions and the extent to which intellectual productivity could be enhanced if the rights of copyright holders are fully protected in the selected institutions.

### RESEARCH METHODOLOGY

The research methodology used is survey. Purposive (judgmental) sampling technique was used to select seven (7) higher institutions in Niger State for the study. The researchers personally administered the two research instruments tagged "Enhancing Intellectual Productivity" questionnaire to the respondents – copyright holders and students. The first instrument tagged "Enhancing Intellectual Productivity O" was administered to 40 copyright owners while the second instrument tagged "Enhancing Intellectual Productivity S" was administered to 700 students. Data were presented with simple statistical tools of: percentages, frequency counts and graphs.

### FINDINGS

The collected data are presented and analysed in this section. It is obvious from Table 1 that 120 (80%) out of the 150 copies of the questionnaire administered to the students at the Federal University of Technology, Minna (FUT) were retrieved while seven (70%) of the 10 copies of the questionnaire administered to the copyright owners

in the same institution were retrieved. In Ibrahim Badamasi Babangida University (IBBU), Niger State Polytechnic, Zungeru (NPZ) and Niger State College of Education, Minna (COE) 90 (90%) of the 100 copies of the questionnaire administered to the students in each of these institutions were retrieved respectively. In College of Wildlife, New Bussa (CWL) 30 (60%) of the 50 copies of the questionnaire administered to the students and three (60%) of the five copies of the questionnaire administered to the copyright owners were retrieved respectively.

It is clear from Table 2 that 60 (50%) of the 120 student respondents are in 500L, while 10 (8.3%) of the student respondents are in 400L, 200L and 100L respectively. Majority of the copyright owners 4 (57.1%) are in the category of senior lectureship while 2 (28.6%) of the copyright respondents are Lecturer I.

The demographic status of students and copyright respondents in Ibrahim Badamasi Babangida University, Lapai (IBBU) is not quite different from that of Federal University of Technology, Minna (FUT). In all other institutions, there is a preponderance of respondents at senior lectureship position than in any other academic positions. Senior lectureship position is always high compared with other positions.

In Niger State College of Education, Minna (COE), all the 4 (100%) copyright owner respondents are from the senior lectureship to the chief lectureship positions. Moreover, 35 (38.9%) of the students respondents from the same institution are from 200L and 300L respectively. In College of Wildlife, New Bussa (CWL) 20 (66.8%) of the student respondents are in 300L while 2 (66.7%) copyright owner respondents are in the senior lectureship cadre.

In Table 3, 16 (50%) of the copyright owner respondents stated that between 11 – 20 percent of their work have been involved in abuse in form of photocopying between 2009 and 2014; while 6 (19%) of the right owner respondents affirmed that between 21 – 30 percent of their work are involved in copyright abuse through photocopy (Figure 1).

In Table 4, 24 (75%) of the copyright owners affirmed that their work have suffered abuse through photocopying between 2009 and 2014 while 6 (18.8%) respondents said their work have not suffered any abuse between 2009 and 2014 (Figure 2).

In Table 5, 20 (62.5%) of the copyright owners affirmed that more than 20 percent of their work have suffered low sale due to copyright violation between 2009 and 2014, while 5 (15.6%) respondents said that less than 10 percent and more than 30 percent of their work respectively have suffered lack of sale between 2009 and 2014 due to copyright violation (Figure 3).

## DISCUSSION

Findings of this study show that majority of the student

respondents who are involved in copyright violation through photocopying are in the higher classes ranging from 300 level to 500 level, National Diploma (ND) 2 to Higher National Diploma (HND) 2, 200 to 300 levels in universities, polytechnics and colleges respectively. This authenticated the findings of Menziner (1980) and Taylor (1988) who affirmed that photocopying is the norm in higher institutions of learning across the globe. It also corroborated the findings of Igbeneghu (2009) who observed the wave of piracy that is on-going in form of photocopying. Moreover, most of the students that are involved in photocopying are probably doing it to optimise their research activities or looking for suitable or relevant materials for their project.

Furthermore, it is crystal clear from the research findings that majority of the copyright owners are from the positions of senior lectureship upward. However, there is a lop-sidedness of copyright owners at the senior lectureship position. This lop-sidedness of copyright owners at such academic position could have been due to the demands for promotion that are associated with such positions. Most of the new entrants into the academic profession in the positions of Graduate Assistants and Assistant Lecturer (in universities),

Assistant Lecturer and Lecturer III (in polytechnics and colleges) are most likely to attach little or no premium to publications. Graduate Assistants in the Universities in particular would want to get themselves busy and struggle to get their masters' degree qualification so as to stabilise themselves on the job. Issues that affect writing and publications could be treated as secondary at this stage. Similarly, academic staff who are in the professorial or chief lectureship ranks are likely to exhibit little or no commitment to publications since they have reached the peak of their career. One of the major reasons why faculty publish is to earn promotion (Buttlar, Mularaki and Brandigan, 1991).

On the volume of copyrighted materials that are involved in copyright abuse, 27 (84.4%) copyright holder respondents affirmed that between 11 and 40 percent of their work are involved in abuse between 2009 and 2014, (see Table 3). This is a serious disincentive to intellectual productivity. There is high possibility that the affected copyright owners are going to be discouraged from further productivity of intellectual work. It would take personal determination and doggedness for the affected right owners to be willing to forge ahead with further productivity of intellectual work. Violation of copyright in whatever formats - illegal duplication in form of photocopying, piracy, etc – tantamounts to robbery of intellectual property. It is counter-productive too. Similarly, 24 (75%) of the right owners said that their work have suffered through photocopying between 2009 and 2014. Such illegal reprography and reproduction of intellectual work are economic termites that could wreck and destroy the economic foundation of right owners, the academia, the nation and by extension the global

**Table 2.** Demographic profile of respondents.

Name of institutions	Categories of respondents	Demographic profile	Population of respondents	Percentage Population of Respondents (%)	
1 Federal University of Technology, Minna (FUT)	Students	100L	10	8.3	
		200L	10	8.3	
		300L	30	25	
		400L	10	8.3	
		500L	60	50	
	Copyright Owners	Graduate Assistant	Nil	Nil	
		Assistant Lecturer	Nil	Nil	
		Lecturer II	Nil	Nil	
		Lecturer I	2	28.6	
		Senior Lecturer	4	57.1	
		Associate Prof.	1	14.3	
		Professor	Nil	Nil	
	2 Ibrahim Badamasi Babangida University, Lapai (IBBU)	Students	100L	Nil	Nil
200L			Nil	Nil	
300L			30	33.3	
400L			20	22.2	
500L			40	44.5	
Copyright Owners		Graduate Assistant	Nil	Nil	
		Assistant Lecturer	Nil	Nil	
		Lecturer II	Nil	Nil	
		Lecturer I	2	40	
		Senior Lecturer	3	60	
		Associate Prof.	Nil	Nil	
		Professor	Nil	Nil	
3 Federal Polytechnic, Bida (FPB)		Students	ND 1	10	12.5
	ND2		25	31.3	
	HND 1		15	18.7	
	HND 2		30	37.5	
	Copyright Owners	Assistant Lecturer	Nil	Nil	
		Lecturer III	Nil	Nil	
		Lecturer II	Nil	Nil	
		Lecturer I	2	50	
		Senior Lecturer	2	50	
		Principal Lecturer	Nil	Nil	
		Chief Lecturer	Nil	Nil	
	4 Niger State Polytechnic, Zungeru. (NPZ)	Students	ND 1	10	11
			ND2	30	33.4
HND 1			25	27.8	
HND 2			25	27.8	
Copyright Owners		Assistant Lecturer	Nil	Nil	
		Lecturer III	Nil	Nil	
		Lecturer II	Nil	Nil	
		Lecturer I	1	20	
		Senior Lecturer	2	40	
		Principal Lecturer	2	40	
		Chief Lecturer	Nil	Nil	

**Table 2.** Contd.

5	Federal College of Education, Kotangora. (FCE)	Students	100L	10	14.3
			200L	20	28.6
			300L	40	57.1
		Copyright Owners	Assistant Lecturer	Nil	Nil
			Lecturer	Nil	Nil
			Lecturer III	Nil	Nil
			Lecturer II	Nil	Nil
			Lecturer I	Nil	Nil
			Senior Lecturer	2	50
			Principal Lecturer	2	50
Chief Lecturer	Nil	Nil			
6	Niger State College of Education, Minna. (COE)	Students	100L	20	22.2
			200L	35	38.9
			300L	35	38.9
		Copyright Owners	Assistant Lecturer	Nil	Nil
			Lecturer	Nil	Nil
			Lecturer III	Nil	Nil
			Lecturer II	Nil	Nil
			Lecturer I	Nil	Nil
			Senior Lecturer	2	50
			Principal Lecturer	1	25
Chief Lecturer	1	25			
7	College of Wildlife, New Bussa. (CWL)	Students	100L	5	16.6
			200L	5	16.6
			300L	20	66.8
		Copyright Owners	Assistant Lecturer	Nil	Nil
			Lecturer	Nil	Nil
			Lecturer III	Nil	Nil
			Lecturer II	Nil	Nil
			Lecturer I	Nil	Nil
			Senior Lecturer	2	66.7
			Principal Lecturer	1	33.3
Chief Lecturer	Nil	Nil			

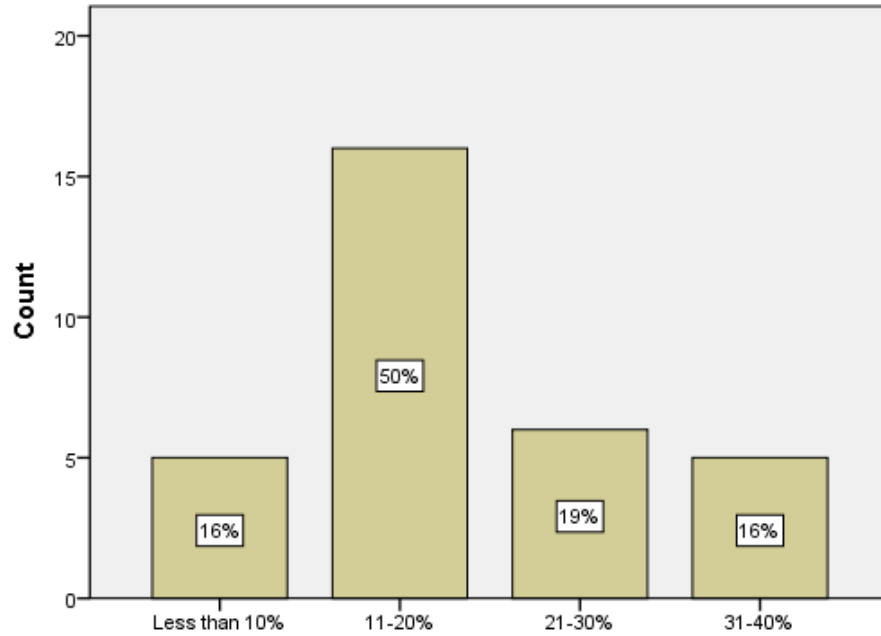
**Table 3.** Volume of copyrighted materials that are involved in abuse.

<b>Volume of copyrighted materials involved in abuse through photocopying (between 2009 and 2014)</b>	<b>Number of copyright holders (respondents) whose works are involved in abuse (between 2009 and 2014)</b>	<b>(%)</b>
Less than 10 %	5	15.6
11 – 20%	16	50.0
21 - 30%	6	18.8
31 - 40%	5	15.6
Above 40%	Nil	-
Total	32	100

economy. However, Asein (2012), while drawing inference from the judgment passed in the United State Supreme

Court on copyright violation argued that copyright violation is not tantamount to robbery or fraud as the owner is not

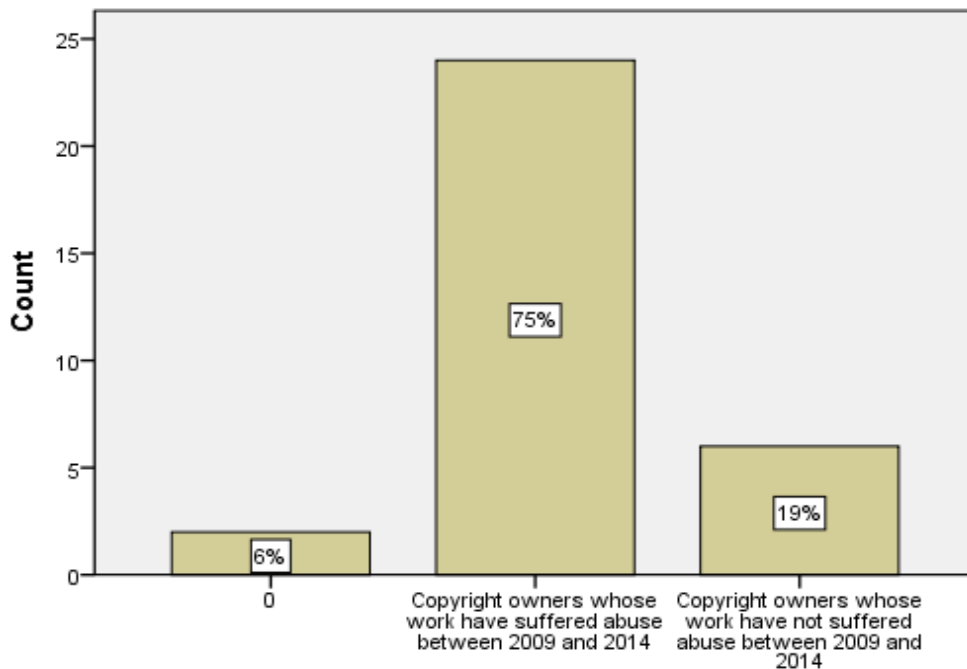




**Figure 1.** Volume of copyrighted materials involved in abuse through photocopying between 2009 and 2014.

**Table 4.** Number of copyright owners whose work have suffered abuse through photocopying.

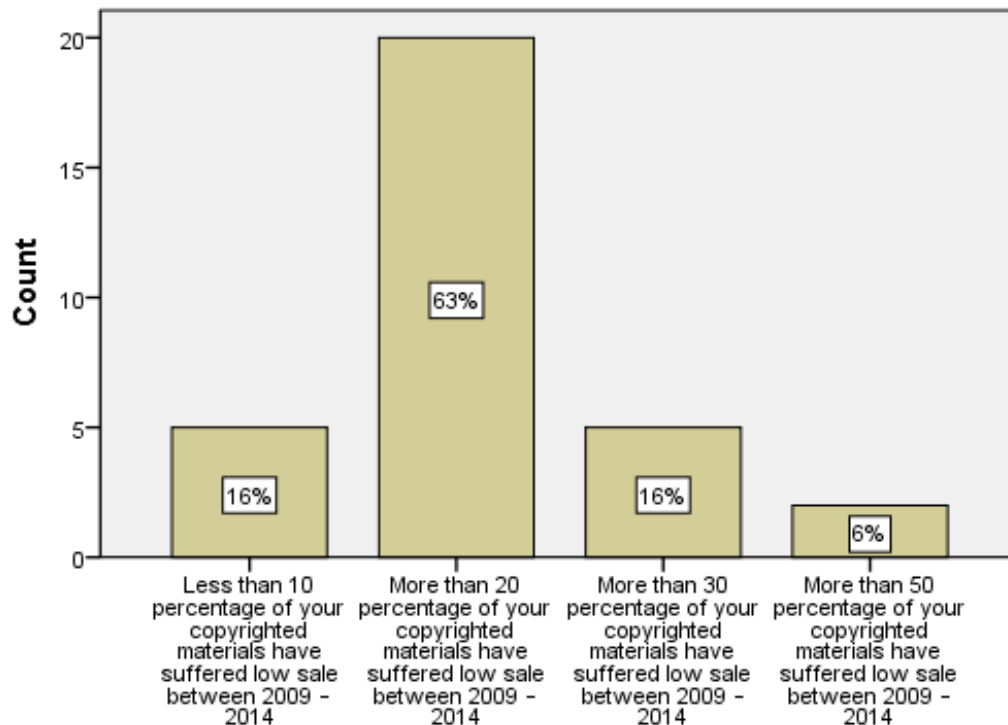
	Copyright owners whose work have suffered abuse between 2009 and 2014	Copyright owners whose work have not suffered abuse between 2009 and 2014	Nil response (%)	Total (%)
Count	24	6	2	32
Percentage	75%	18.8%	6.2%	100%



**Figure 2.** Number of copyright owners whose works have suffered abuse.

**Table 5.** The extent to which sales of copyrighted materials have suffered low sale due to copyright violation.

The extent to which copyrighted materials have suffered lack of sale between 2009 – 2014	No of copyright owner	(%)
Less than 10 percentage of your copyrighted materials have suffered low sale between 2009 – 2014	5	15.6
More than 20 percentage of your copyrighted materials have suffered low sale between 2009 – 2014	20	62.5
More than 30 percentage of your copyrighted materials have suffered low sale between 2009 – 2014	5	15.6
More than 50 percentage of your copyrighted materials have suffered low sale between 2009 – 2014	2	6.3
Total	32	100

**Figure 3.** The extent to which copyrighted materials have suffered lack of sale between 2009 - 2014.

totally deprived of his right.

Moreover, 27 (84.4%) copyright holder respondents equally affirmed that more than 20 percent of their work have suffered low sale due to copyright abuse in form of photocopying between 2009 and 2014. It then implies that the copyrighted materials that have been produced were made to waste since no buyers were forthcoming. It equally means that if the copyright holders have borrowed money from the bank to produce their work, they would be paying the loan and the interest from a business that is bringing no benefit. In addition, other costs of maintaining and sustaining the business would also be running concurrently without anything to show for. For example, the variable costs (like payment of salary, transportation, fuel, etc) and the fixed costs (like house rent, security, electricity and sanitation) would be running and have to be paid in a business that is bringing zero

return. Copyright violation in form of photocopying is akin to thief of creativity, innovation and productivity. This authenticates the position of Babalola (2006, 2008) and Okwilagwe (2001, 2006). If intellectual productivity would receive a boost all forms of illegal reproduction of intellectual works must be properly curbed and controlled through the instrumentality of law – copyright. Copyright remains the sine qua non to intellectual creativity, innovation and productivity. Without full enforcement of copyright, all efforts to accentuate intellectual productivity in the academia would appear like a mirage. It is important to enforce copyright on copyrighted materials and make violators of copyright to face full wrath of the law. It is hoped that it is only then that the anticipated intellectual productivity in the academia would receive a boost.

It should be added that if the work of majority, 27

(84.4%) of the copyright holders do not suffer low sale due to the illegal photocopying of their materials, the right owners would under normal circumstances make enough sale. In consequence, if they make enough sale, their per capita income (income per head) would definitely receive a boost. This increase in per capita income has the propensity of accentuating their zeal for further intellectual productivity. This is because they would be assured that the more they produce the more income they are likely to get. If the work of all the right owners in all higher institutions of learning in Niger State and by extension in Nigeria is protected from illegal reproduction in form of photocopying, one can now imagine the gamut of income that would accrue to the pocket of right owners across the nation. With such income, there is every likelihood that the right owners would receive enough motivation and encouragement to embark on further productivity. This is because money remains the major motivating factor why people work (Ngulube, 2000; Akintoye, 2000; Adeleke, 2001; Sakir and Fajonyomi, 2007; Senyah, 2012)

## CONCLUSION AND RECOMMENDATIONS

From the foregoing discussion, it is apt to conclude that copyright would enhance intellectual productivity in tertiary institutions in Niger State if properly handled. The following recommendations are made in the light of the study.

1. Intellectual property law should be made a core course that should be taught in all higher institutions in Nigeria. It should not be restricted to the Department of Library and Information Science alone. If this is done, it is hoped that it would not take time to enlighten majority of the student on the danger of piracy and on the need for fair use of information resources.
2. It is recommended that all photocopying centres in higher institutions in Nigeria should be made to open register for all the materials that are being photocopied and this should be monitored. Any photocopying of material that is more than fair use should be penalised and compensation paid to authors of such materials.
3. The Nigerian Copyright Commission (NCC) should also organise enlightenment workshops for all stakeholders - lecturers, researchers, students and photocopying managers – in higher institutions of learning in Nigeria.

## Conflict of Interests

The authors have not declared any conflict of interests.

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