

Research on Continuous Auditing

A Bibliometric Analysis

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Abstract — This paper presents the results of a bibliometric study about the evolution of research on Continuous Auditing. This study has as main motivation to find reasons for the very slow involvement of research on this topic. In addition, Continuous Auditing is one of the features of the emerging concept of Continuous Assurance. Thus, considering that Continuous Assurance represents numerous advantages for the organizational performance, this study also intends to understand if there is a relation between the evolution of research on Continuous Auditing and the still very low maturity levels of continuous assurance solutions. This study shows that the number of publications is considerably reduced and that the slow growth of research on Continuous Auditing may be contributing to the lack of maturity of Continuous Assurance.

Keywords - continuous auditing; bibliometry; continuous assurance; research.

I. INTRODUCTION

Organizations have been subjected to a strong pressure to audit both their financial business processes and other processes of great relevance in the various dimensions associated with organizational performance. In this context, Continuous Auditing appears as an effective tool to provide, in run-time, credibility and reliability to the organizational processes.

Continuous Assurance is another concept that emerged as a powerful tool which, using technology, provides compliance of the organizational processes simultaneously with, or shortly after, the occurrence of events of the process under evaluation [1]. However, despite the numerous advantages associated with the implementation of continuous assurance solutions [2, 3], there are few successful implementation cases documented, mostly in recent years, and thus we can say that Continuous Assurance is developing at a very slow pace [4-6].

In Figure 1 we can observe that Continuous Auditing is a crucial element of Continuous Assurance. Continuous Auditing refers to the activities carried out that give credibility to the operations, in addition to allowing more timely control and risk management. Continuous Monitoring (CM) is another element responsible for constantly monitoring and evaluating transactions and their controls, allowing a real-time view of the effectiveness of controls and the integrity of transactions [7].

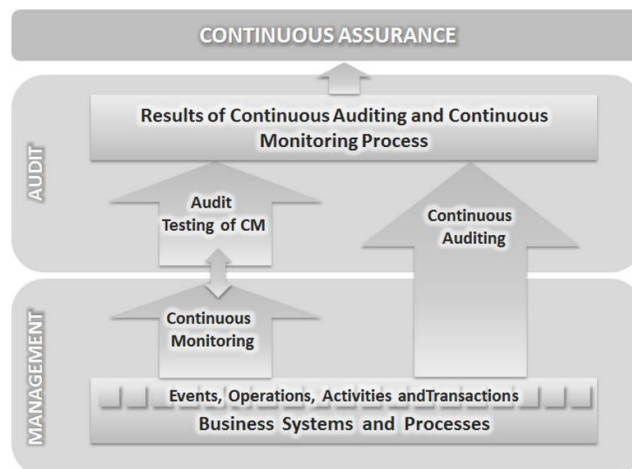


Figure 1. Continuous Assurance (adapted from [8])

Moreover, we may observe that the audit activities assess whether the management activities are appropriate and effective so that organizations can have a greater degree of certainty regarding the effective operation of controls, risk management and integrity of systems, and the information for decision making [8-10].

Given the advantages that organizations can obtain from the implementation of Continuous Assurance, a faster evolution of research on this topic would be expected. Therefore, as a starting point to understand this slow evolution, we intend to analyze the research evolution of one of its most important component: Continuous Auditing.

This paper consists of this introductory section, which presents the motivation of this work; a section that briefly presents the concept of Continuous Auditing; a section that describes the methodology and methods used to conduct the study; a section that analyzes the results of the study; and a final section with some considerations.

II. CONTINUOUS AUDITING

Continuous Auditing refers to the activities undertaken to provide warranty and credibility to operations, and besides, to give a more timely character to issues of control and risk management. Continuous Auditing is property of the audit

function and includes any audit process which is repeated regularly [8, 10].

The Institute of Internal Auditors defined auditing as an independent activity of objective assessment and of consulting designed to add value and improve operations of organizations while achieving their objectives through a systematic and disciplined approach in the evaluation of effectiveness of risk management, control and governance processes [11, 12]. Continuous Auditing is based on a paradigm shift which disregarded the traditional function of financial and accounting control of auditing. Its action changed its focus to the identification of all the risks involved in the various activities of the organization, intending, in this way, that its objectives are met as efficiently and effectively as possible [11-13].

Continuous Auditing can also be defined as a process of collecting and evaluating data in order to determine and ensure efficiency and effectiveness of accounting systems in real time, to safeguard assets, maintaining data integrity and producing reliable financial information [14]. Chan and Vasarhelyi [15] state that Continuous Auditing enhances the quality of the auditing process, given the higher probability of detecting errors, fraud and violations, since it provides a complete view of all transactions within an organization, contrary to what happens in the traditional auditing, which only selects a sample of transactions because of the time-consuming manual testing. The automation of controls through Continuous Auditing reduces the number of manual errors within processes and also a decrease in time and resources needed for problem solving [16]. The complete coverage of transactions increases the possibility of detecting problems (e.g. the existence of reports that are automatically generated at the end of each month to detect duplication of payments), enabling their resolution sooner and reducing the likelihood of spread of the problem [17].

Thus, the benefits of Continuous Auditing are clear: it reduces risks; diminishes losses and fraud attempts; facilitates the objectives of internal control; allows timely access to information; allows drill-down of data, transactions and processes; integrates internal and external stakeholders; helps external auditing and improves operational transactions and processes, ensuring their compliance; allows timely adjustments by conducting operational testing and data analysis; relieves the auditors of routine tasks, allowing them to concentrate on other tasks; and increases confidence in transactions and operational processes, in decision making and in financial statements [18, 19].

III. METHODOLOGY

This work is the result of a bibliometric analysis of a set of publications searched and collected from the Scopus® database. Scopus® was the chosen database since currently it hosts a wide range of works in several scientific areas, namely the area of this topic. The merit and quality of the publications indexed by this database by several scientific research institutions are also widely recognized.

The search was carried out on April 11, 2017, using the terms "continuous auditing" and "continuous audit" as search keys in the fields of the title, abstract and keywords of the

publications. In addition, the search was limited to the period from 2000 to 2016. The reason to choose this time period was to include the largest possible range, considering that the concept of Continuous Auditing emerged in the late 1990s. Thus, we considered the beginning of the period in 2000 and the end in 2016, the latter being the last full year prior to this study. The search expression obtained was:

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(TITLE-ABS-KEY ("continuous auditing"))
OR TITLE-ABS-KEY("continuous audit"))
AND (PUBYEAR > 1999 AND PUBYEAR < 2017)
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The list of publications obtained was analyzed and we verified that all publications were within the desired search parameters. Thus, 207 publications were considered in this study.

The bibliometric study consisted of analyzing the:

- number of publications per year;
- number of citations per year (total number of citations versus number of citations excluding self-citations);
- number of publications by document type;
- number of publications by scientific area;
- number of publications by country of affiliation of the authors;
- number of publications by author.

IV. RESULTS AND ANALYSIS

The results reveal that the number of publications that meet the search conditions is relatively small when compared to other topics, and considering the benefits that organizations could avail from the implementation of continuous audit solutions. A total of 207 publications were obtained. Regarding the evolution of the number of publications over the years (Figure 2), most publications (about 65%) occurred after 2010, and the number of publications tends to grow, albeit at a slow pace. An additional search showed that a very small number of publications appears in the database in the years prior to 2000, being the overwhelming majority of publications on health subjects, which demonstrates the appropriateness of the time interval chosen for the study.

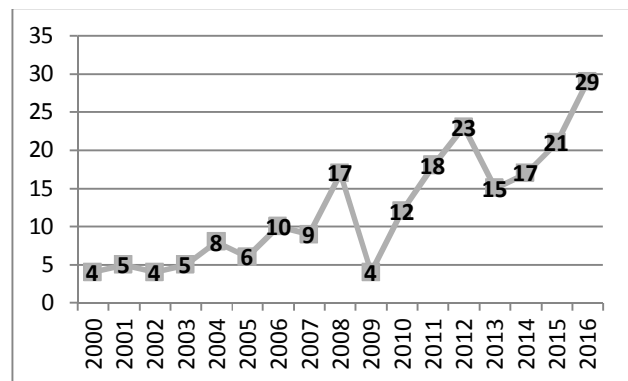


Figure 2. Evolution of the number of publications per year

Regarding the number of citations (Figure 3), there has been a gradual increase in recent years, totaling 1902 citations. In the first years the number of citations was not very expressive, and was considered relevant only after 2010, since about 80% of the total citations are found after 2010. We also observed that only about 10% of citations are self-citations, which may indicate that despite the small number of publications, there is a considerable number of authors researching on the topic.

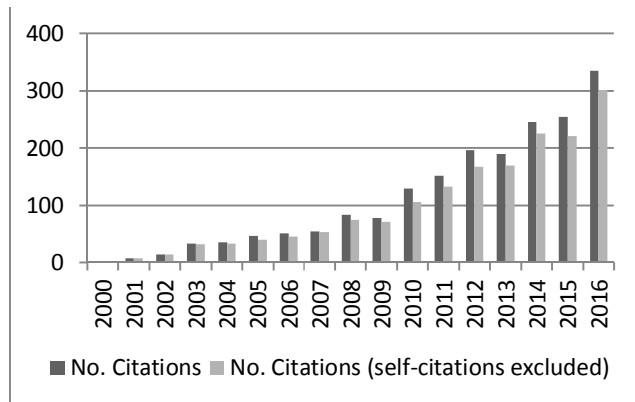


Figure 3. Evolution of the number of citations per year

According to Figure 4, most publications (61%) are articles published in journals and about 27% are conference papers. About 12% of publications refer to other document types. This situation may denote a low scientific maturation of the topic, since the books and the reviews are publications more associated with topics with several published scientific works and with a considerable level of maturity, and in this search, these document types present an extremely low number of publications.

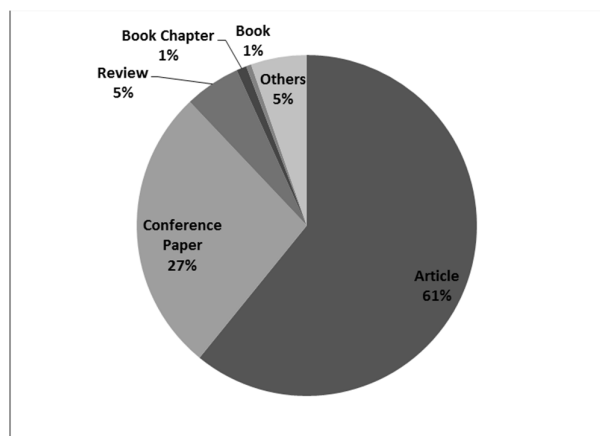


Figure 4. Distribution of publications by document type

The scientific areas in which more publications on this topic are found are, according to Figure 5, essentially technological and business areas. This is due to the fact that Continuous Auditing makes use of information and communication technologies, namely those associated with information systems, in order to improve the audit process,

increase the likelihood of detecting anomalous situations in run-time, ensure the internal control and, consequently, improve the operational performance and support the decision making, which are generally of organizational interest. However, a not inconsiderable portion of publications are on health subjects, specifically on Medicine.

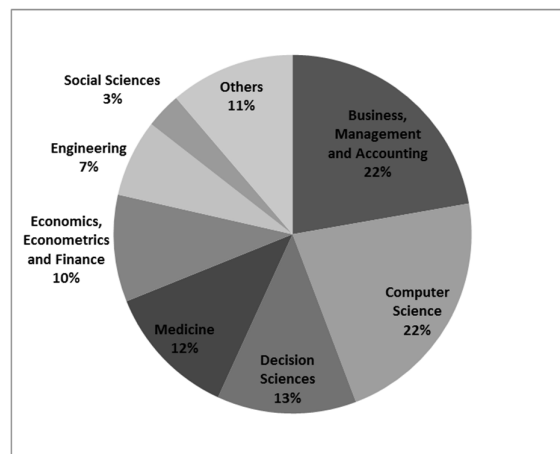


Figure 5. Distribution of publications by scientific area

This research topic has raised interest mainly among researchers affiliated in American and European research institutions (Figure 6), who contributed with 70% of publications. However, according to Table I, it is to emphasize the preponderance of authors affiliated in the United States, which individually accumulate about 32% of the total of publications. In Europe, the contribution of researchers affiliated in research institutions from the United Kingdom accounts for around 13% of publications and in Asia it is worth highlighting the contribution of authors affiliated in Chinese research institutions with about 9% of publications.

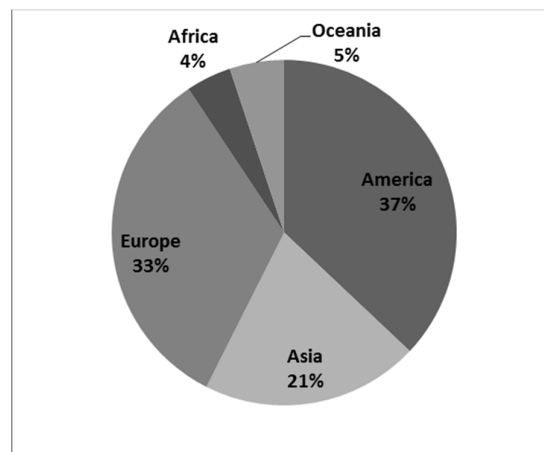


Figure 6. Distribution of publications by continent

Regarding the authors (Figure 7), we observe a total of 151 authors. Of these, Vasarhelyi, M.A., affiliated to Rutgers University, USA, contributed with the largest number of publications, totaling 22. The author Alles, M.G., with 11 publications, comes second in this ranking, sharing the

affiliation and co-authorship of publications with Vasarhelyi. Out of 151 authors, 89 (about 59%) present a single publication, demonstrating that a very significant number of authors do not continuously research on Continuous Auditing, or that this topic is not one of their main research interests. About 36% are authors with 2 to 4 publications. Only 3% of the authors published between 5 to 9 papers and only Alles, M.G. And Vasarhelyi, M.A. present more than 10 publications.

TABLE I. NUMBER OF PUBLICATIONS BY COUNTRY

Country	No. of Publications
United States	67
United Kingdom	27
China	19
Canada	15
Germany	13
Taiwan	11
Australia	10
Romania	6
Sweden	5
Others	34

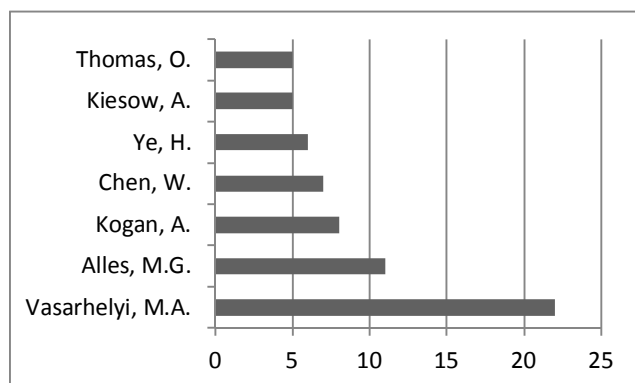


Figure 7. Number of publications by author

V. CONCLUSION

This study makes clear that the research on Continuous Auditing is still very scarce and in maturation. Considering that this, together with continuous monitoring, is one of the essential elements of the concept of Continuous Assurance, it is possible to establish the relation of this research shortage with the slow pace in the development of complete continuous assurance solutions. In fact, the contribution to the development of Continuous Assurance can only be effective when all its elements are properly studied.

Although the research was restricted to Scopus® database, this study can be considered quantitatively representative of the current status of research in Continuous Auditing.

For future work, we intend to increase the scope of the study to other scientific databases and to analyze the research

status of the other elements of Continuous Assurance, in particular continuous monitoring and risk assessment. This will allow the weaknesses of the research on Continuous Assurance to be identified and will enable researchers to develop and implement models which contribute to the development of research in this area and which help organizations to consolidate the paradigm shift (from continuous audit to continuous assurance).

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