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## **RETURN ON INVESTMENT (ROI) FOR PROJECTS: A BIBLIOMETRIC STUDY**

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Master of Science in Business Administration

Supervisor:

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ISCTE – Instituto Universitário de Lisboa

MScBA, 2.º Cycle degree

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January 2022

Department of Marketing, Strategy, and Operations

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## **Resumo**

Esta dissertação analisa a maturidade da utilização do ROI para projetos em trabalhos académicos. Os estudos bibliométricos relativos ao grau de maturidade da adoção de metodologias ROI em projetos são insuficientes. A aplicação da metodologia ROI permite um maior alinhamento com o negócio, identificação de programas ineficientes, tomada de decisões informadas, etc. A questão de pesquisa é: «como foi organizado e desenvolvido o conhecimento científico acerca do “Retorno sobre O Investimento” durante os últimos anos?» Para responder a isto, foi desenvolvido um estudo bibliométrico académico com uma amostra de 42 artigos das Ciências Económicas, em inglês e português. Como conclusão, o número de documentos que mencionam ROI nos últimos cinco anos sofreu uma diminuição repentina em 2019 para depois atingir um pico em 2020, os EUA são o país com a maioria das publicações sobre ROI, e a maioria dos papers são artigos.

**Palavras-Chave:** ROI; metodologia ROI; questão de pesquisa; Retorno sobre O Investimento; estudo bibliométrico.

**Classificação JEL:** M1 – Administração de Empresas; M10 – Geral

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## **Abstract**

This dissertation analyzes the maturity of the use of ROI to projects in academic papers. Bibliometric studies regarding the degree of maturity of the adoption of ROI methodologies in projects are insufficient. Applying the ROI methodology permits greater alignment with the business, identification of inefficient programs, informed decision-making, etc. The research question is: «How the scientific knowledge of “Return On Investment” is organized and developed during the last years? » To answer this question, an academic bibliometric study was developed with a sample of 42 papers from the Economic Sciences, in English and Portuguese. As a conclusion, the number of documents mentioning ROI in the past five years suffered a sudden decrease in 2019 for then to reach a peak in 2020, the USA is the country with most of ROI publications, and most papers are articles.

**Keywords:** ROI; ROI methodology; research question; Return On Investment; bibliometric study.

**JEL Classification:** M1 – Business Administration; M10 – General

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## **Glossary**

BPM – Business Processing Management

CHVACV – *La Contribution Horaire à la Valeur Ajoutée Sur Coût Variable*

CNCI – Category Normalized Citation Impact

CSMP – Complex Stakeholder Mapping Process

CSR – Corporate Social Responsibility

CWTS – Center for Science and Technology Studies

FIGS – Figures

FWCI – Field-Weighted Citation Impact

HR – Human Resources

IF – Impact Factor

IMFI – Investment Management and Financial Innovations

IRR – Internal Rate of Return

IS – Information Systems

IT – Information Technology

MIRR – Modified Internal Rate of Return

NPV – Net Present Value

ROI – Return On Investment

SAP – Systems Applications and Products

SAP ERP – Systems Applications and Products Enterprise Resource Planning

SAP S/4HANA – Systems Applications and Products S/4HANA

SJR – SCImago Journal Rank

SNIP – Source Normalized Impact per Paper

TV – Television

UK – United Kingdom

USA – United States of America



# 1. Introduction

## 1.1 Context

The current market order demands frequent decisions concerning new investments from the entrepreneur. As Dumitriu (2008) argues there is an imposition for continuous alterations at organizations, whether in the production process or in need for technological innovation to attain better competitiveness, and insertion or maintenance in a globalized and increasingly competitive market. In this regard, Business Processing Management (BPM) is making the companies life easier in the optimization of processes.

This scenario of constant competition creates in business managers' doubts about how to manage the different ventures under their responsibility in the best possible way and how to ensure that the necessary changes in the organization and their business occur at the right time, guaranteeing the desired time success.

To support this process of change, new and sophisticated technologies have emerged that seek to meet the information needs of organizations and guarantee their operational and tactical functionality. Information associated with technological resources is now seen as a primary need. Information Technology (IT) resources, mainly Information Systems (IS), play a crucial role in the business scenario. By opting for a technology or a new Information System, organizations trigger an internal change process that aims to change their character and position in the business world. For instance, CSMP, that is, Complex Stakeholder Mapping Process is adopted by businesses for decision-making processes. It offers flexibility in the development of a project (Kariyawasam et al., 2019).

Change processes can be directly associated with investments. Changing an organization's profile, creating a new product, and implementing new technology are actions that generally involve high investments. Investments in technology, Lee and Lee (2020) claim, especially those based on IT, are the ones that most consume the budgets of current organizations. That is why Business Information Modeling (BIM) is opted by many construction businesses to estimate ROI to satisfy customers.

ROI is the abbreviation for return on investment. As the name proposes, ROI tells how much cash the organization loses or gains from ventures made in various channels. It is a pointer that gives the end-product of each activity or mission, as well as estimating the expense of new apparatuses and preparing for the area. That way, one can recognize which ventures are

beneficial and how to upgrade those that are as of now working so they can perform far and away superior. This measurement is fundamental since it permits an individual to evaluate how certain drives add to the organization's outcomes. Along these lines, it depends on ROI that you will want to design objectives in view of substantial outcomes and get whether it merits putting resources into specific channels.

Current organizations seek in technology a competitive differential. It is expected that it is possible to manage organizational changes, and ensure operational and strategic gains with the information, coupled with technological resources.

## **1.2 Implications and Relevance**

Fu et al. (2019) say that given its high cost, IT executives and professionals are constantly questioned about the return on the investment made in technology. However, presenting the benefits and gains related to this investment is not always easy. Many marketers are observing various technologies to determine the value for ROI.

Smart cities and community projects are becoming the need of today, and it includes novel evaluation framework (Kourtzanidis et al., 2021). In the investment evaluation process, executives and managers commonly use a financial measure called ROI (Return on Investments), which relates investment and result, and presents the profit or cost saved with an investment.

ROI has been widely applied to the evaluation process of IT investments, and it is usually used as a justification for project approval. Given the characteristics of IT projects, ROI evaluation involves identifying and classifying tangible and intangible benefits associated with the investment. These benefits are subsequently converted into cash flow, thus enabling the evaluation of the investment and monitoring results.

The ROI Methodology is a strategic evaluation tool that allows planning, controlling, and improving training programs and interventions, with the aim of strengthening human capital and impacting business indicators. It helps you identify successful programs and redesign or discontinue ineffective ones, thus improving the targeting of resources. It is based on the model of the four levels of evaluation of Donald Kirkpatrick, adding a fifth level of financial type (ROI) developed by Jack Phillips. This last level allows identifying the impact of the program in relation to the organization's indicators and isolating the variables that may affect the results.

It is currently used in dozens of countries to improve the effectiveness and efficiency of human resource programs. The methodology has been implemented in different areas of human

resources such as training, organizational climate management projects, performance evaluation programs, accident reduction, and well-being, among others. Following are some benefits of applying the ROI Methodology: greater alignment with the business, greater closeness and involvement with stakeholders, human resource management based on quality and continuous improvement, identification of inefficient programs, increased ability to show value, informed decision-making, training, and development programs are constantly improving the understanding of responsibility in obtaining results.

The implementation of technology appears as a competitive strategy that, from an economic point of view, focuses its efforts on obtaining the highest returns through collaboration and efficient project management. Nonetheless, the incorporation of a new technology implies additional costs and changes in management processes, therefore, as a first impression it would not be a very attractive option. Nevertheless, when highlighting all the benefits offered by the application of BIM and SAP, that stigma could be offset by optimizing time to make design improvements and obtain a better-quality product. However, and supporting the thesis that it is possible to obtain a favorable impact on the profitability of the project by using BIM, it would be beneficial to use technology as a mechanism to improve the management processes of a residential real estate project. As Xu et al. (2019) announce, Chinese cities are being built on urban fabric, which are being replaced by new structures based on technology.

Therefore, it is necessary to encourage the use of technology to improve the management of real estate projects, for which an evaluation methodology is proposed that will serve for the analysis and decision-making regarding the use of SAP in a high-rise residential real estate project. Thus, pursuing one of the interests of this thesis study, framed in promoting the use of technologies that support the management and study of the project prior to the execution stage, that is, focusing efforts on the design stage.

### **1.3 Research Problem**

This study is based on the maturity of the experience of applying a ROI evaluation process to projects in academic papers.

Investments have always been widely regarded as a market of opportunity for companies, national and international, in the most varied economic sectors, especially for those engaging in ROI projects. Consequently, it is necessary for most companies to comply with technological standards and competitiveness in such a way that it is possible to reduce the existing gap with

other companies that have a greater technological development to carry out their management processes.

Interestingly, it has been investigated that there are no antecedents or sufficient studies about the bibliometric analysis regarding the degree of maturity of the adoption of ROI methodologies in projects from an academic perspective. ROI is an effective indicator when it comes to calculating the return on an application, being suitable for all investments and different channels, such as those made in marketing campaigns events, among others. Investors will also look at ROI when evaluating a company, as it is critical to know how much they will earn to calculate whether the investment is worth it. Being aware of this indicator also allows a company to plan goals based on possible results to be achieved, noting what has been accomplished previously. It can also identify the time that investments take to bring a return in each area.

#### **1.4 Document Structure**

The following question is going to guide this research and will be answered in the conclusion of the thesis: How the scientific knowledge of “Return On Investment” is organized and developed during the last years?

In this dissertation, secondary data are going to be analyzed to evaluate the employment of ROI for projects in academic papers. The article is organized as follows: Section 1 - presents the introduction, the research problem, and the research question; section 2 - presents the literature review, the research methodology, and the research objectives; section 3 - presents the bibliometric analysis; section 4 – presents a discussion that confronts the bibliometric analysis’ results with the pertaining literature; and the conclusion, where the main findings of this study are summarized.



## 2. Literature Review

### 2.1 ROI: Return On Investment

Donaldson Brown developed the expanded Return On Investment (ROI) measure, or DuPont formula, in 1914. It is a premise of this paper that Brown's "Eureka", i.e., the ROI formulation ( $R = T \times P$ ) or "Rate of Return on Capital equals Rate of Turnover of Invested Capital times Percentage of Profit on Sales", was and remains of essential significance (Flesher & Previts, 2013). ROI is defined as a value that measures the relationship between the expected benefit over the investment made, i.e., by measuring the profitability of the investment, it enables to know how efficient the evaluation of the expenditure process is.

Return on Investment is a way for companies to determine the relationship between the amount invested in a financial project and the financial gains obtained therefrom. For Stranieri et al. (2021), ROI is the amount of money that returns from an investment as the study has been carried out on the agri-food business, and they determine that blockchain technology has a positive impact on ROI. Thus, the decision-making processes can be aimed at avoiding the financial loss that bad investments might entail and make companies consider their costs and the benefits of the investments made in their work processes.

Thus, ROI became a popular investment analysis measure since it was developed to measure profits and guide decisions with views to demonstrating whether an investment is economically viable. Despite that, it was difficult to convince Malaysian developers that BMI technology could have positive impact on ROI (Latiffi & Tai, 2019).

The simplest expression of investment measurement is established by the equation, which adopts the subtraction of return obtained with investment cost as the numerator, comparing with investment cost in place of the denominator. In fact, there are two methods for calculating the ROI:

1<sup>st</sup> Method:

$$\text{ROI} = \text{Net Return On Investment} / \text{Cost Of Investment} * 100\% \quad (1)$$

2<sup>nd</sup> Method:

$$\text{ROI} = (\text{Final Value of Investment} - \text{Initial Value of Investment}) / \text{Cost Of Investment} * 100\% \quad (2)$$

The ROI formulae can be used broadly to analyze the business as a whole and to evaluate an individual project or area. Working in this way, it is possible to identify errors and problems in any part of the business. In addition, the result will be in percentage, which makes it easier to compare the ROI of different actions or strategies.

Jin, Liu and Long (2021) have constructed a backpropagation neural network for the analysis of cost-benefit in financial projects. And Sherman argues that the demand for power is increasing day by day, and therefore, power companies are working to provide more energy to consumers with the least costs to provide a good service and obtain profit in a sustainable fashion.

In literature, there is no absolute conformity as to the concepts that feature in the numerator and denominator of the ROI calculation. And, in addition to this, there are several definitions of ROI:

For example, Klene et al. (2018) points out that ROI is an important measure of a firm's profitability, as it measures the firm's efficiency in managing invested capital. That is, it is a measure of the company's ability to generate profit.

Return on Investment is "a percentage obtained through calculations, which shows the recovery of the investments made by a company", that is, according to Nofiana and Sunarsi (2020), it is a measure of the company's capacity to generate profit, i.e., the percentage of growth in the value of capital.

Talk about the integrated approach of safety and sustainability through the ROI metric method. They express that ROI is one of the most popular approaches to analyze the performance of investments and consider that ROI is conceptually interesting because it combines profitability factors (such as revenues, costs, and investments) transforming them into a percentage rate (Moreno et al., 2019).

Nakash and Bouhnik (2021) comment that companies used the ROI formula because they considered it the best individual measure for the performance of planning, evaluation, and control of the profit obtained by the owners of the company.

Socially responsible firms could achieve better results as compared to those which do not opt for CSR initiatives for the financial sector. According to Hou (2019), ROI is viewed as an indicator that evidences the return obtained by investment decisions, evaluating whether the venture was economically attractive, that is, it presents ROI as a parameter for the evaluation of the company's performance in relation to previous periods.

It is stated by Asare (2019) that to obtain better results, many companies are partnering with private investors and organizations. He further understands that ROI is used by companies

as one of the prime indicators to support investment decision-making. It is calculated considering the annual benefit arising from the investment divided by the amount invested and is a measure that quantifies the return produced by investment decisions and evaluates the economic attractiveness of the enterprise, acting as a moderating variable (Rangkuti, 2019).

ROI represents how much return the country will get from each investment, especially for students who go to a host country for studying purposes (Tran et al., 2020). Thus, for each investment made, one must determine what is the benefit generated for the company.

Valdivia et al. (2020) emphasize that in the development of various types of projects, ROI can be used as a support tool for investment decisions because it offers a projection of returns already at the time of designing the cost and composition of the capital involved. Within this context proposed by Esmael et al. (2018), it is emphasized that ROI performance may be determined by two financial tactics:

- i. Operational Strategy: pricing policy, production scale, quality, purchasing, stocking decisions, etc.
- ii. Investment Strategy: most productive use of capital, technology capital, technology hardware, and the identification of new economically attractive investments.

ROI is understood as an umbrella concept, Michopoulou and Moisa (2019) argue, where engagement rates, customer response, and volume of likes and comments are most important. Krizanova et al. (2019) point out that the Operational Strategy seeks to relate ROI with efficiency (doing things right) and Investment Strategy relates ROI to effectiveness (doing the right thing). Within this prism, Krizanova et al. (2019) clearly show that the first strategy focuses on the operational systemic level of a given organization, while the second focuses on the managerial level.

It is important to note again, that ROI has been incorporated into all types of investments. This reflects the growing demand for evidence of positive returns on investment in all types of projects. Today, clients, especially those funding projects demand critical evaluation data, and ROI measurement can be a valuable tool to communicate the positive impact of a project on the organization.

ROI is used for measuring quality, processes, procedures, change management, marketing, and others. Furthermore, product configuration system is used by many companies for designing customized products. It helps in analyzing the cost through ROI (Kristjansdottir et al., 2018).

According to Lee and Lee (2020), the BIM ROI helps in reducing the rework in construction phase. From this research, it positive results came that showed that BIM has significant impact to satisfy decision-maker.

In the case of software, ROI aims to identify if the software after its implementation generated the expected return, or at least if it covered the amount invested by automation of the business processes of a given organization. According to Fajardy and Mac Dowell (2018), the key reasons why one should use ROI are: force planning - management must have a plan to measure the efficiency and direction of objectives; to provide a basis for decision-making - remove certain intuitive decisions within an encouraging and quantitative basis; simplicity - the concept itself is quite simple; evaluate management performance - this includes accountability performance; measuring market responses - measuring management response to market changes in sales and requirements, as well as profitability, and profitability and cost reduction measures; evaluating investment opportunities - assessing the effect of the company's profitability. These investment opportunities will also include alternative investment or new product opportunities; facilitate communication - the perception of a project is different for each hierarchical level in the company or even for each department involved in it. The ROI value can be used as a bridge between teams to convey the value of the project underway, regardless of their level of expertise in the financial area; business sector fit - increasingly, companies feel the need to see their investments pay off in short to medium term, especially in software. ROI allows you to evaluate the project globally.

In the methodology we will follow the format of questionnaires to the community of project managers to understand the maturity of the adoption of the concept. ROI methodology has gained importance regarding program evaluation as it helps in reporting a balanced set of measures, and it follows step by step process. Furthermore, it also adheres standards of carrying out a conservative approach. The data is categorized into five levels: reaction & planned action; learning; application & implementation; business impact; and return on investment (ROI).

The ROI Methodology incorporates design thinking principles in four stages to collect data accurately at the right time. ROI methodology has intangible and tangible benefits. The intangible benefits are more important to an organization than to get a positive ROI (Hollenbeck, 2019). These benefits could be satisfaction, commitment, and teamwork. This methodology has a credible process and helps in showing the contribution of important programs.

## 2.2 Critical Analysis, Gaps and Doubt

One of the biggest challenges faced by organizations today is measuring the financial value of different training projects. The ROI methodology, developed by the ROI Institute (USA), has proven to be an accurate, credible, and viable tool to translate into financial results all projects and training programs, of any type of organization. This methodology is adopted and used in more than 50 countries, being internationally recognized as the leading approach in the evaluation of return on investment.

The ROI methodology can be applied to different sectors of activity, including services, health, telecommunications, banking, government, and public bodies, among others. The focus of this paper is on the development of research and evaluation skills, indispensable for the development of ROI Studies. It will fill the following gaps in the research: calculate ROI; identify and collect qualitative and quantitative indicators from different sources; identify the benefits of the ROI process for data collection and analysis; know the ROI methodology, its benefits and applications; and present the final results in terms of Return On Investment; successfully apply the ROI model in training projects; and, transform qualitative indicators into financial ones.

## 2.3 Main Literature Review Grid

Table 2.1 – Main literature review grid

Author	Title	Journal (Year)	Main Issues
Fu, Phillip & Phillip	ROI marketing: Measuring, demonstrating, and improving value.	<i>Performance Improvement</i> (2018)	Company performance assessment
Jin, Liu & Long	Impact of cost-benefit analysis on financial benefit evaluation of investment projects under back propagation neural network.	<i>Journal of Computational and Applied Mathematics</i> (2021)	Cost-benefit analysis
Latiffi & Tai	The influence of building information modelling (BIM) towards return on investment (ROI) from the perspective of	<i>MATEC Web of Conferences</i> (2019)	The impact of ROI on banks in Malaysia

	Malaysian developers: A qualitative approach.		
Lee & Lee	A framework for evaluating an integrated BIM ROI based on preventing rework in the construction phase.	<i>Journal of Civil Engineering and Management (2020)</i>	Satisfaction of both customers and decision-makers through the integration of BIM and ROI
Ben-Gal	An ROI-based review of HR analytics: Practical implementation tools.	<i>Personnel Review (2019)</i>	The importance of HR analytics to assess the financial impact on any given sector

**2.4 Research Objective**

The current paper focuses on a quantitative approach. Any investment made by a company must and will always be seen as a disbursement made to generate a flow of future benefits, usually working with return expectation in a period exceeding one year. Given the fierce competition existing in the financial market coupled with the shortage of resources available for the realization of investments, the projects, more than ever, must consider various alternatives or scenarios for their realization.

The need for an efficient control of investments made organizations start to value a good ROI estimation, that is, Return on Investment. But what is ROI? When and how to get it? This question is currently asked very often to IT professionals and business analysts and is still difficult to answer.

**2.5 Research Techniques**

The proposed methodology performs the evaluation of IT investments for large projects, assessing the company's current characteristics and determining the time and the return rate over the project's investment. This evaluation is not only a financial evaluation, but also an

evaluation of the organization's information technology structure and of the value added by the project. The methodology is comprised of the following phases:

- i. Information gathering: The survey is done from standard questionnaires that assess the current situation of the company. These questionnaires are focused on each of the areas involved in the project and are important to determine the percentage that can be applied to value drivers. Value drivers are variables that will provide financial gains; for example, accounts payable process cost is a value driver where a percentage will be applied to determine the added value.
- ii. Determining project value: The investment values compared to the benefits are the essential information to conduct the analysis. The project value is determined from the costs of training, consultancy, hardware, and software, which are the most relevant costs of the project. The investment value will be projected along with the gains obtained by the project.
- iii. Definition of the benefits generated by the project: The gains calculated by the project are based on benchmarks using the SAP ERP implementation process. These benchmarks have conservative or aggressive parameters, determined according to the information gathered in the questionnaires. The organization is questioned in relation to its processes and the degree of IT application. This information will determine the use of one of the types of bench markings. The benefits are obtained through the comparison of the business processes basis (without SAP ERP) and the processes to be (considering the performance of the project with SAP ERP).
- iv. Capital Readjustment: The capital must be corrected over time because all capital applied has a cost paid to third parties (banks) or internal costs (it is not used in another investment).
- v. Survey of expectations regarding the implementation: The objective of this survey is to verify what the expectations of the project managers and the involved management are regarding the implementation of SAP ERP.

When analyzing the process of software implementation, it is possible to notice that an organization is strongly inclined to improve its business processes in the organizational axes. Choosing return concentration axis or strategic direction has strategic choices responsible for the achievement of the company's desired results.

The axis, therefore, must permeate the paths to be followed for the success of the business, preferably combining among themselves. By defining these axes, the priority(ies) is established

within an organizational environment. The pre-established axes presented in the method are Management and Intellectual.

**Management Axis:** within this context, the management axis of the proposed method aims to identify the level of contribution that the software implementation offers to the company's results, such as greater productivity for the execution of business processes, reducing time and consequently costs within the organizational environment.

**Intellectual Axis:** Intellectual capital refers to the value of a company's collective knowledge and resources that can provide it with some form of economic benefit. It's also used to identify a firm's intangible assets and divide them into meaningful categories. Within this context, the intellectual axis points to all the knowledge, information, intellectual property, and experience offered during the software implementation process. It is important to point out that the Intellectual Axis - given the quantity of subjective variables that permeate the questions inherent to knowledge management can be approached by the management team.

## **2.6 Research Instrument**

The profit from speculation is communicated as a rate. Its shortening is ROI for profit from speculation. Solidly, the last option makes it conceivable to look at speculations by considering the cash put away and the cash acquired (or lost). It permits you to direct your decisions as far as ventures to pick the most productive. The ROI offers the chance of assessing the arrival of a past or current venture or of assessing the return that future speculation will acquire over a given period. Regardless of whether the time boundary mediates straightforwardly in the recipe, the totals won or lost are considered over a yearly period. We are discussing yearly returns.

It describes four levels of results according to which training can be evaluated. The first level that of reactions, is based on the evaluation of participants' satisfaction with the training seminar. The second level is that of the evaluation of learning, where the knowledge developed by the participants is evaluated, for example through an exam. The third level is that of behavior, where the application by the participants, in their daily work, of the knowledge or methods acquired during the seminar is assessed (Meignant, 2001). The fourth level of evaluation is that of the effects on the performance of the organization and the estimation of the added value associated with changes in behavior at work. The evaluation of training performance is at level 5.

The most used performance ratio is that of return on investment (Phillips & Schirmer, 2008) which aims to establish the relationship between the added value of training (e.g., a gain



following an increase in sales or an increase margins) and all the costs it represents for the organization (organizational and logistical costs, trainer's fees, paid time for participants). The most common ROI evaluation method is the method developed by Phillips in 1997. It consists of a five-step process beginning with the creation of a list of indicators that will be affected by the training (p. rate of staff turnover, duration of production stoppages or quantity produced).

The second stage of this method, the collection of data relating to these indicators, is done several times, at least once before and after the training. Data analysis begins with the isolation of the training effect (Step 3), which can be done using a control group, trend projection, or expert consultation (Phillips, 1997). The objective of step 4 is to convert as much data as possible into monetary values. All data for which the conversion was possible enters the calculation of the return on investment. The following formula makes it very easy to calculate the return on investment in percentage:

$$\text{Return on investment (\%)} = (\text{investment gain} - \text{investment cost}) / \text{investment cost} \quad (3)$$

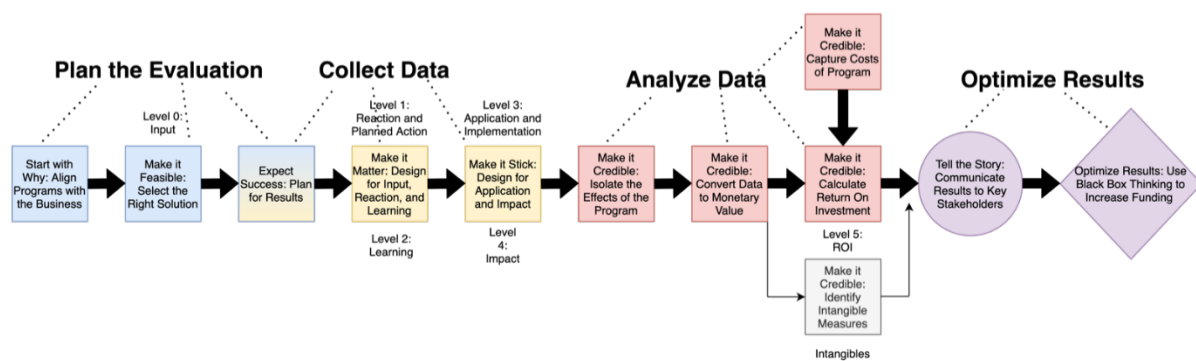
The ROI calculation method does not consider the risk of each project. A significantly higher ROI on a project can also hide a much higher risk rate. It will therefore be up to the investor to arbitrate between potential profitability and risk incurred.

**Table 2.2** – Levels of the chain of impact

Chain of Impact
Level 1 – Reaction and Planned Action
Level 2 - Learning
Level 3 – Application and Implementation
Level 4 – Impact (Tangibles and Intangibles)
Level 5 – Return On Investment

The data for which the conversion was not possible are nevertheless cited in the evaluation report under the category “intangible benefits”. This process has been followed for the evaluation of many training seminars, in various fields such as quality management, staff management (Phillips & Phillips, 2007) or sales techniques (Tesoro, 1998). The Phillips method works well when the outcome indicators correspond to time savings. As an example, Nathan (2009) calculates the ROI language training by asking the trainees to estimate the time they

save in their work thanks to a better command of English. It then converts the time saved into a monetary value using a monetary cost indicator, the hourly wage cost, which makes it possible to estimate the theoretical value of an hour of work saved. A similar estimation approach is found in the cost-value method of activities by Savall and Zardet (2008). This method aims to measure the average economic value generated by an hour of work in the organization, regardless of the service or activity considered. This method (Savall & Zardet, 2008), to estimate the cost or the value of an hour of work in an organization, favors the use of “the hourly contribution to the added value on variable cost” (CHVACV), an indicator which considers the turnover and the variable expenses of the organization. Savall and Zardet (2008) report a CHVACV of between 26 and 53 euros / hour for industrialized countries.



**Figure 2.1** – The ROI methodology model in 12 steps

However, when the measurement of time indicators, or the measurement of directly financial indicators, is not possible, the Phillips method becomes complex to implement. Critics of the method mainly blame it for its heaviness and cost. Burkett (2005) notices that HR practitioners give up evaluating the performance of training due to a lack of knowledge, means, financial or human resources. A second criticism concerns the difficulty of comparing the different evaluations because of the multiplicity of indicators used. In the examples cited by Phillips, the assessments are all based on different indicators. But the most important criticism concerns the difficulty of finding relevant impact indicators and of extrapolating a financial value from them (Dunberry & Péchard, 2007). Due to lack of information for the conversion, part of the profits cannot be included in the ROI and must be presented separately, in a quasi-anecdotal way. This method therefore seems inappropriate for estimating the financial return of managerial training involving soft skills, skills whose impacts are more difficult to determine with objective quantitative indicators.

## 2.7 Measures and Scales

One reason for this difficulty is a problem of definition. In accounting or finance, ROI is defined as a measure of net income that an organization can earn from its total assets. Return on Investment is calculated by dividing net profits and fees by total assets. This definition may be acceptable for an organization, but unrealistic for an IT project or for the various alternatives of IT solutions related to a project. When we talk about ROI, we actually seek answers to two important questions:

- i. How much will we get in return (“return”) for the money that will be spent (“investment”)?
- ii. When? (“ROI”)?

For a given use of money in an organization, ROI is understood as how much profit or cost savings are achieved. An ROI calculation can be used in conjunction with other approaches to develop a business case for a given proposition. As a quantitative measure of investment and outcome, ROI offers executives a simple tool to help them choose between alternatives to maximize productivity, add value, and evaluate organizational performance. Alone or in combination with another measure, ROI is the most widely used performance and productivity indicator in organizations. It is a comprehensible tool that normalizes distinct activities allowing their comparison. The overall ROI of an organization can be used to classify how a company is managed.

Traditionally, when IT professionals and business leaders discuss the ROI related to an IT investment, they seek to address the financial tangible benefits that can be achieved with the solution. IT project selection decisions are generally based on the value of the investment. The IT value is determined by the relationship between what the organization will pay (costs) and what it will receive in return (benefits), the greater the sum of benefits in relation to costs, the greater the value of the IT project. Financial benefits are understood as those that impact the organization's budget and its finances, such as cost reduction, revenue increase and cash flow. Financial ROI in organizations is generally calculated through one or more "financial metrics" that are individually or collectively understood as ROI.

These metrics include, but are not necessarily limited to:

- Payback Period: the time required for the benefits archived to return the initial investment in the project.
- Net Present Value (NPV): the value of future benefits calculated in present monetary values.

- Internal Rate of Return (IRR): benefits calculated based on a rate of interest.
- Modified Internal Rate of Return (MIRR): rate of interest that considers both the cost of investment and reinvestment.

As proposed by Seddon (2000), ROI determines the value of the project as of the identification of the benefits generated by it. Its main objective is to support the decision-making process related to IT investments.

### **3. Bibliometric Analysis**

#### **3.1 Quantitative Analysis**

As Govindaradjou and John (2014) say, bibliometric studies relate to the scientific production of a researcher, a unit, a department or even a project. But there are also bibliometric studies on the scale of an institution, a country, a continent, etc. It discusses the quantitative analysis of the properties and behavior of recorded information, highlighting authors, methods, and the application of quantitative methods as support for decision making in information systems. It addresses the evolution of the bibliometric concept, including the researchers' interpretation of the subject and the limitations of bibliometric applications.

This is the methodological approach used in the present work and consists of a quantitative review of the literature, carried out through bibliometric analysis techniques. First, research has been made on the usage of the phrase "Return On Investment (ROI)" in academic papers in the title, abstract or keyword of publications in the Scopus database, which has a wide coverage for some research areas, such as engineering. From the initial search, the time limitation was established, continuing in a series of searches, following inclusion and exclusion criteria, until obtaining a sample of articles considered relevant in the subject in question, which was analyzed.

The criteria used for the selection of articles cover articles and conference papers in English, applied in the industry.

#### **3.2 Bibliometric Study**

Bibliometric data is mainly used to steer research. As Su et al. (2020) argue, it allows in particular:

- To know and follow the scientific production of a department, a unit, or in a theme.
- To identify a specialist in a field or to spot new potential collaborations.
- Find new sources of funding.
- Reveal emerging topics or competitors.
- To select journals to which to submit their articles.
- To meet each of these needs, there are several different methods or indicators. It is necessary to fully understand what each of them represents to choose the appropriate

indicators. Bibliometrics can also help in the assessment and can be considered in the evaluation of researchers. However, it is recommended:

- To not evaluate researchers solely on the grounds of bibliometric indicators.
- To be aware that scientific disciplines and sub-disciplines may have different publication methods and citation behaviors.
- Not to evaluate researchers according to the impact of the journals in which they publish, but on the value of the publication itself.
- To always associate several indicators.
- To be familiar with the limitations of the database used to calculate these indicators.
- To be aware of the differences in coverage between the databases to be able to choose the appropriate database.
- Not to compare indicators that have been obtained from different databases.

For several years, a growing number of institutions have been denouncing the perverse effects associated with the use of indicators for the evaluation of researchers.

### **3.3 Bibliometric Indicators**

All markers have their advantages and disadvantages. It is in this way important to pick the fitting markers as indicated by the target of the bibliometric investigation. The most notable pointers are (Thanuskodi, 2010):

#### **3.3.1 h-record (or h-list)**

This record makes it conceivable to assess the logical effect by considering the efficiency of an analyst, a unit, an establishment, and so forth. An h-list of 10, for instance, really intends that among the articles distributed, ten were referred to multiple times.

#### **3.3.2 Sway variable (or effect factor)**

This is a marker that actions the effect of a diary. The effect factor determined by Clarivate Analytics shows the normal number of references gotten by every one of the articles distributed in a diary during the last two (or even five) years. This thusly gives a thought of the effect that a diary has had on science over this period.

### **3.3.3 Number of archives (Scholarly Output)**

This is the quantity of archives created by a unit, a specialist, or an organization whose usefulness we wish to assess.

### **3.3.4 Number of references (Citation Count)**

This is the complete number of references gotten by every one of the archives broken down.

### **3.3.5 Reference rate (Citations per Output)**

This is the normal number of references per record.

### **3.3.6 Field-Weighted Citation Impact (FWCI) or Category Normalized Citation Impact (CNCI)**

This marker was made by the Center for Science and Technology Studies (CWTS) in Leiden. It is the proportion between the quantity of references gotten by a distribution and the world normal expected for a comparable field of action, sort of distribution and year of distribution. For instance, a Field-Weighted Citation Impact of 2 demonstrates that the distributions dissected were referred to twice as much as the world normal.

### **3.3.7 Yields in Top Percentile**

This is the number or level of distributions having been referred to enough times to be among the most referred to distributions on the planet (contrasted with distributions of a similar sort, of that very year and in a similar field). By and large, we utilize the top 1% and 10% of the most referred to articles.

## **3.4 New Indicators**

The need to work on existing markers and the utilization of informal organizations have prompted the formation of new pointers (Du et al., 2015).

### **3.4.1 m-file (or m-record)**

It relates to the h-record isolated by the quantity of long stretches of distribution examined. Without a doubt, one of the issues with the h-file is that the more extended a specialist's profession, the higher his h-list. By isolating by the number of years, the record is diminished to a worth autonomous of the term of the profession.

### **3.4.2 SCImago Journal Rank (SJR) of a diary**

It is the quantity of references gotten by an article from this diary during the three years following its distribution, every reference gotten being weighted by the reputation of the referring to diary. It is determined in the Scopus information base.

### **3.4.3 Source Normalized Impact per Paper (SNIP) of a diary**

It estimates the effect of this diary by considering the quantity of references gotten by the articles of this diary distributed during the most recent three years, the complete number of articles distributed by similar diary during similar period and the likely number of references in the diary's disciplinary field. This pointer was made by the Center for Science and Technology Studies (CWTS) in Leiden. It also is determined in the Scopus information base.

### **3.4.4 CiteScore of a diary (or series)**

It is the proportion between the quantity of references gotten by every one of the records distributed in this diary (or this series) during the past three years and the quantity of reports distributed by this diary (or series). It is determined in the Scopus information base.

### **3.4.5 Eigenfactor of a diary**

It is the level of references gotten by all articles in the diary during the past five years out of the absolute references gotten during similar period by all articles in all diaries dissected in the Journal Citation Reports. It is determined in the Web of Science information base.



### **3.4.6 Hot Papers**

It is a pointer proposed by the Essential Science Indicators information base (by means of the Web of Science): it considers the articles distributed during the most recent two years which are in the top 0.1% generally referred to during the 2 months going before the update of the data set.

Altmetrics do not demonstrate an effect yet a group of people on the web and let you in on which analyst is making the information in a field. Online media refers to are counted (likes, retweets, downloads on Mendeley, and so on) Social effect pointers are critical to consider with regards to Open Science. One approach to estimating the effect on society can be through the computation of pointers on licenses, on articles in the prevailing media, or on the number of meetings given (on the radio or on TV), yet this kind of information is presently challenging to gather and stays divided.

### **3.5 Population and Sample**

An exploratory descriptive analysis was carried out through bibliometric methods and indicators, using the Scopus database to extract the records related to the usage of the phrase “Return On Investment (ROI)” in academic papers. Secondary data was retrieved from the Scopus database. As of the latter, Learning Analysis has drawn in expanding consideration by specialists, professionals, and foundations. In the beginning stage is the issue: how to lead a best-in-class examination of a learning investigation? To address this inquiry, this study planned an exploratory review to acquire an outline of the Learning Analysis subject. It characterizes the inquiry articulation and the units of examination to gather data from the Web of Science. The information examination was upheld by VOSviewer (to create the organizations of the use of the expression “Return On Investment (ROI)” in scholarly papers). Notwithstanding an overall outline, the outcomes permit us to create new inquiries that will give the design of the writing audit, considering a strong theoretical model. This strategy permits advancing from the portrayal of fundamental and pertinent articles to more organized and interconnected investigation.

### **3.6 Instrument**

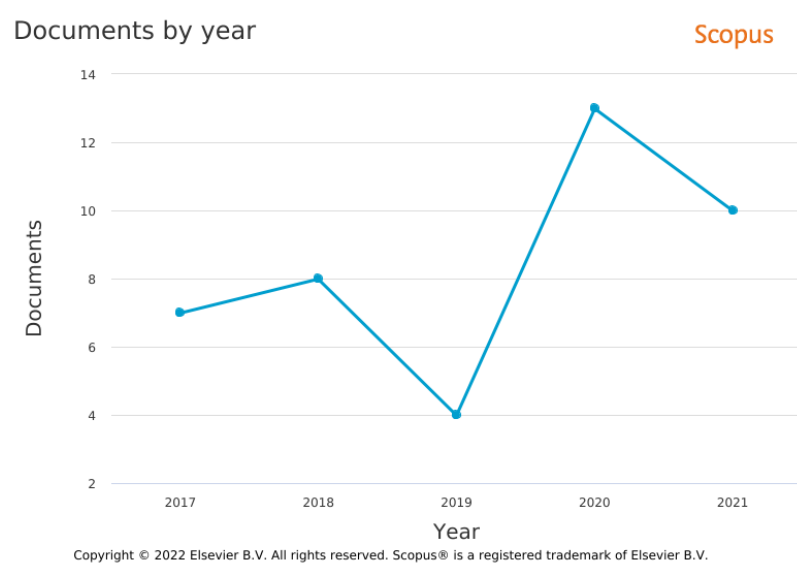
The open access software VOSviewer version 1.6.18 was used for the construction and visualization of bibliometric maps, which include data on authors, journals, number of citations, references, keywords, among others. Content analysis was performed by analyzing the frequency of words, through the sets of terms shared between the documents. In addition, the relevance of publications was analyzed based both on the number of citations in the Scopus database and on the impact factor index (IF) of the journals, according to the Journal Citation Report of 2015.

### **3.7 Graphic Analysis**

The search for the acronym “ROI” and for the phrase “Return On Investment” on the SCOPUS database was made by limiting the publication year of the papers, journals and articles from 2017 to 2021 (the 5 past years), by narrowing the focus of the subject areas to Business, Management and Accounting, and Economics, Econometrics and Finance, and by restricting the languages used to English and Portuguese. The result were 42 documents.

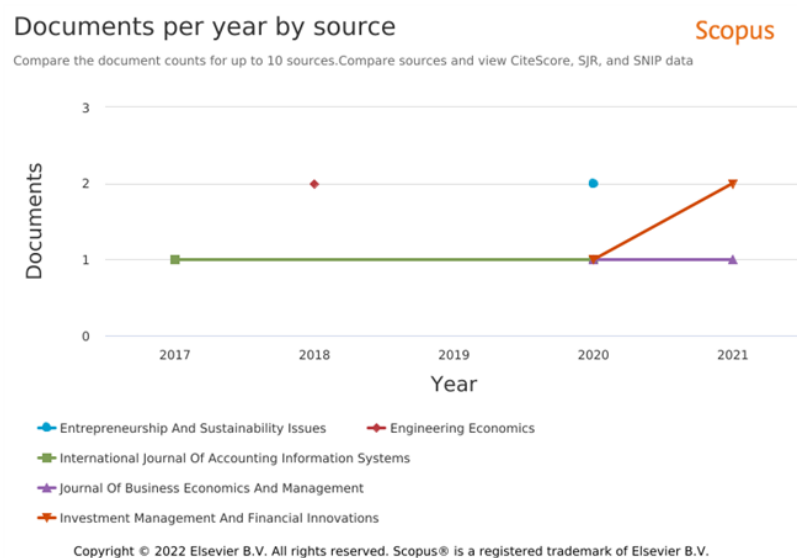
#### **3.7.1 Graphic Analysis using SCOPUS**

As seen in the graphic, there was a great volatility in the publication of papers using ROI in the past 5 years. This may be related to external factors such as the Covid-19 pandemic, but it would be somewhat speculative to say something about it at such a short distance. That is why sometimes in an analysis more questions than answers arise.



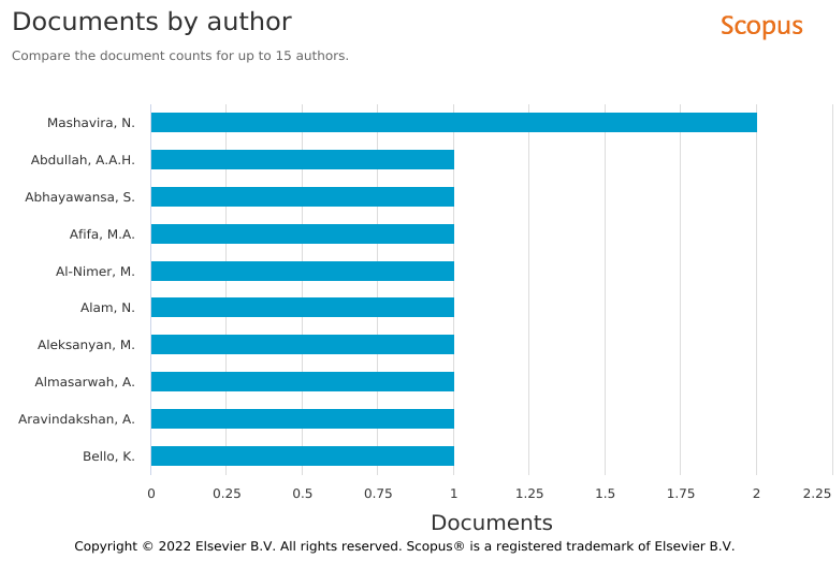
**Figure 3.1** – Number of papers using ROI in the past 5 years

Figure 3.2 illustrates that the International Journal of Accounting Information Systems is the main source of published documents per year from 2017 to 2020. But then, the Investment Management and Financial Innovations becomes more prominent a source, starting precisely in 2020 all the way to 2021. The Journal of Business Economics and Management also becomes relevant between 2020 and 2021, but with half the publications of the IMFI.



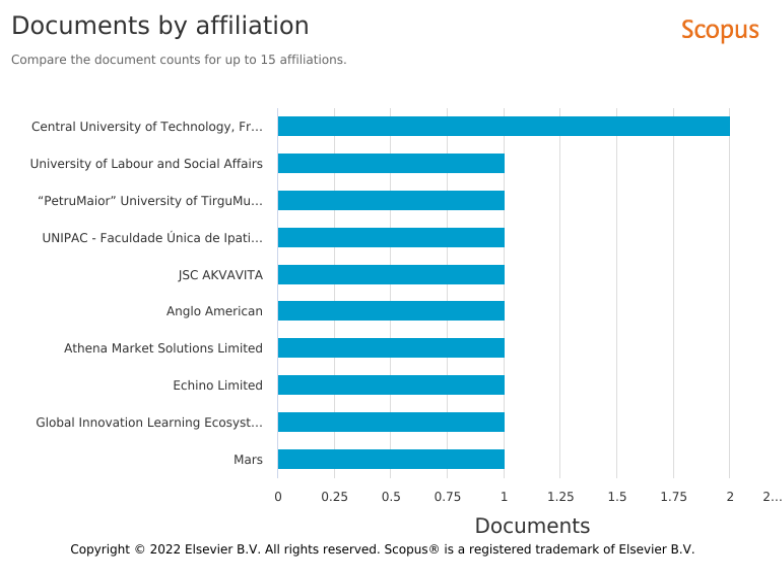
**Figure 3.2** – Number of documents published per year according to the main source

In Figure 3.3 the mode is 1 document published by author, having N. Mashavira, extraordinarily, published 2 papers.



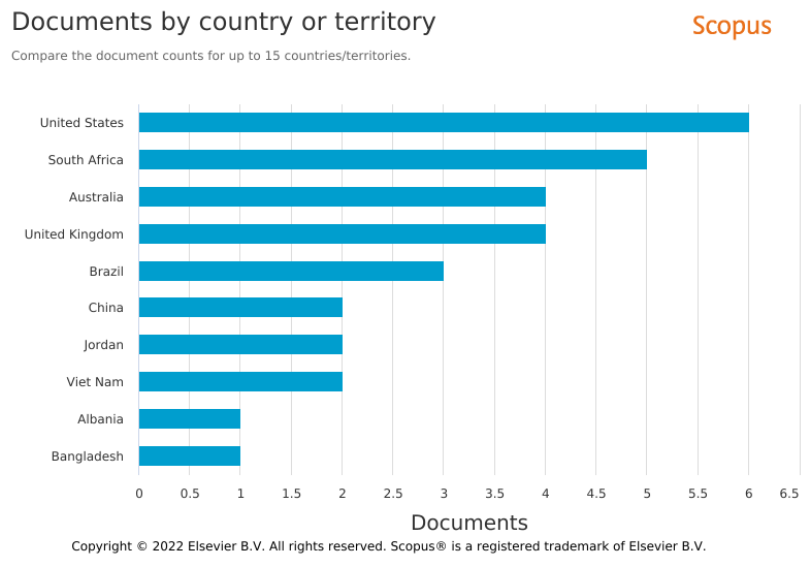
**Figure 3.3** – Number of documents published by author

The figure below shows that the mode each paper published having only one affiliation. Having the Central University of Technology, Free State, in South Africa, published 2 documents mentioning ROI, with its affiliation.



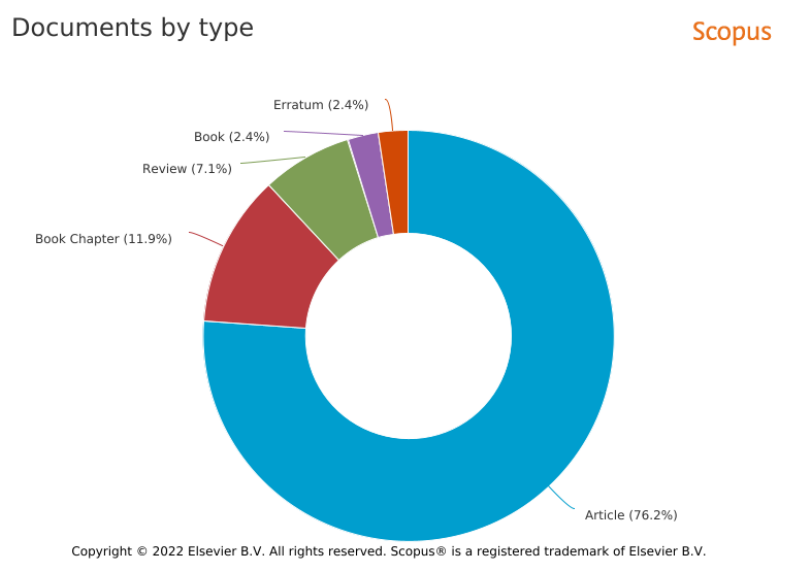
**Figure 3.4** – Number of documents published by affiliation

In Figure 3.5 the differences are more than evident. The USA, followed by South Africa, and then by Australia and the UK, is the country with the most publications worldwide. This means that besides English being the preferred language in Business and Economics, the USA cares and incentivizes the publication of new scientific works, in this case in the field of ROI.



**Figure 3.5** – Number of documents published according to the country or territory

Figure 3.6 gives us the information that there is an overwhelming use of the article (over 76%) as a means of publishing papers. More than all the other options combined, being it that the book chapter comes second.



**Figure 3.6** – Documents by type

As shown in the figure below, both Business, Management and Accounting, and Economics, Econometrics and Finance, with 38.2% each, combined are the subject areas according to which these papers were published and that tells us that it is within the realm of the Economic Sciences that ROI is mostly developed as an investment tool, from an academic point of view.

Documents by subject area

Scopus

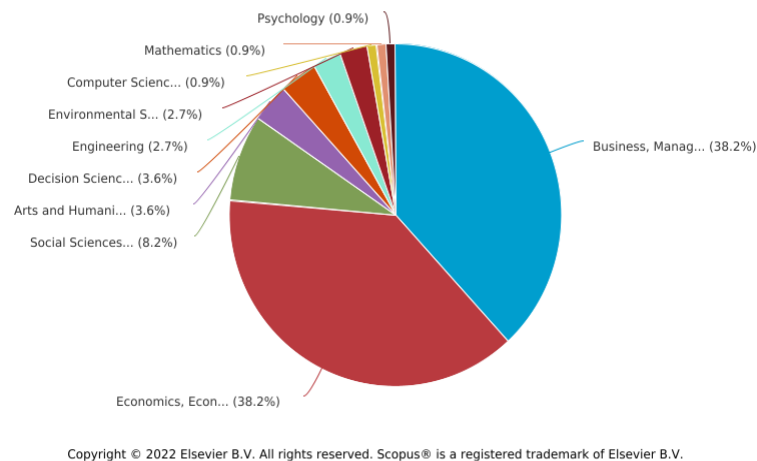


Figure 3.7 – Documents by subject area

Figure 3.8 makes it clear that the mean, the mode, and the median all coincide. They are 1, because all papers from this sample had only one sponsor. And this should make us wonder why still some countries have many more publications than others. Is it the amount of funding received per author that makes a country more productive than other? Or is it merely a matter of geographic and demographic size of each country influencing the numbers?

Documents by funding sponsor

Scopus

Compare the document counts for up to 15 funding sponsors.

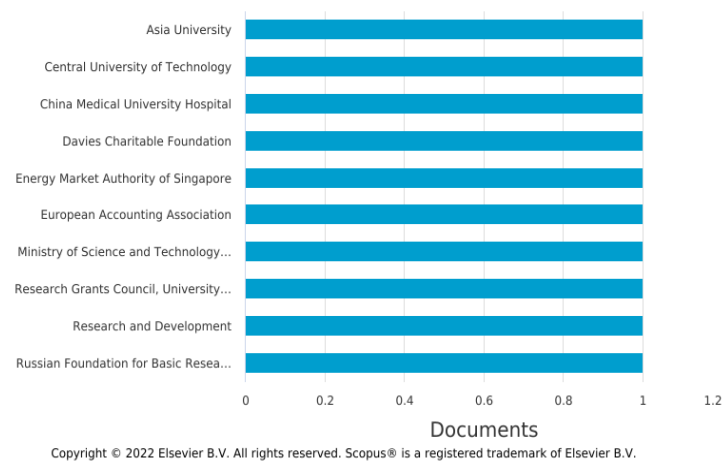


Figure 3.8 – Documents by funding sponsor

### 3.7.2 Graphic Analysis using VOSviewer

The following two graphics (figs. 3.9 and 3.10) are based on 94 items, 40 clusters, and 79 links. The first visualization measures the weight of citations and the second the weight of documents.

To create these maps the thresholds chosen were at least a document per author and with no minimum of citations of an author. For each of the 94 authors, the total strength of the co-authorship links with other authors were calculated. The authors with the greatest total link strength were selected.

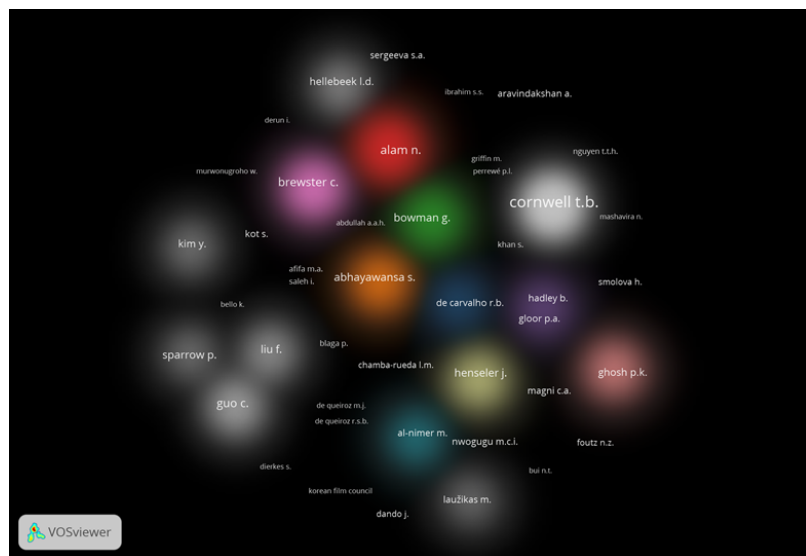


Figure 3.9 – Weight of citations

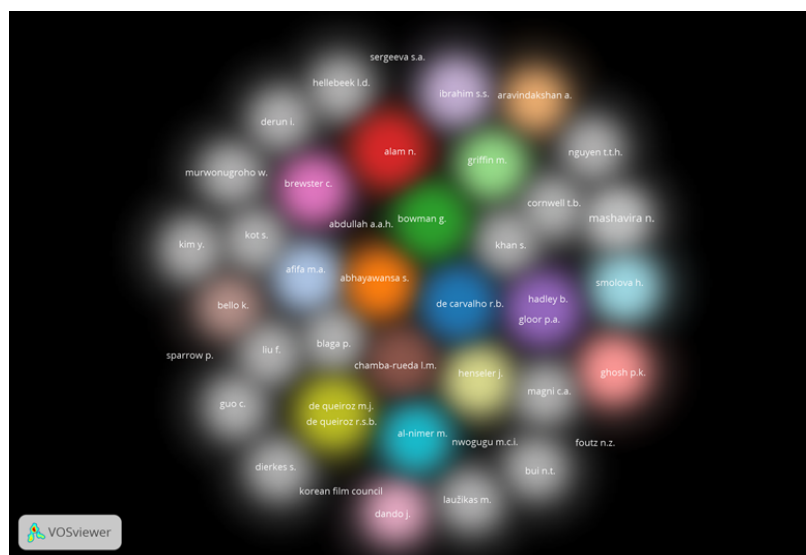


Figure 3.10 – Weight of documents

## 4. Discussion

In the last chapter, the conducted bibliometric analysis was described, being based on a search for the acronym ROI and for the phrase Return On Investment on the SCOPUS database, filtered with limits regarding the year of publication, being papers, journals, and articles published between 2017 and 2021, referring to specific scientific areas, such as business, management, accounting, economics, econometrics, and finance, written either in English or Portuguese. As a result, 42 documents were retrieved and further analyzed.

When assessing the year of publication of the retrieved documents, it was found that there was a great volatility in the last 5 years, maybe related to external factors, such as the Covid-19 pandemic, even though it might be a bit speculative to say something about this volatility at a short distance. Thus, in this aspect more questions arise instead of some answers being provided.

In terms of the source of publication, it has been found that up until 2020, the journal with most published documents was the International Journal of Accounting Information Systems. However, that changed in 2020, with the Journal of Business Economics and Management becoming more relevant between 2020 and 2021, despite registering half the publications of the previously mentioned journal.

Considering the authors with more papers published between 2017 and 2021, only one (N. Mashavira) published 2 documents, with the remaining authors (9 in total) only having published one document/paper. In terms of affiliation, most of the published papers only had one, with the Central University of Technology, Free State, in South Africa, having published 2 documents that mentioned ROI during these last 5 years.

When assessing the differences in terms of the number of published papers by country or region, the results were more than evident. The USA, immediately followed by South Africa, Australia, and the UK, was the country with the most publications worldwide, which means that besides English being the preferred language in Business and Economics, the USA both cares and incentivizes the publication of new scientific works in the field of ROI.

Of the 42 retrieved documents, 76% are articles, with the remaining being either, book chapters, reviews, books, or erratum. In terms of the subject areas, most of the documents pertain to the Business, Management and Accounting, and to the Economics, Econometrics, and Finance (38.2% for each), which means that ROI is mostly developed in the literature as an investment tool, from an academic point of view. An interesting finding is related to the fact



that all documents only had 1 sponsor, making us wonder why still some countries have more publications than others, considering that all institutions worldwide only have one active sponsor.

Basically, all these findings are congruent with the study's goal, which was to assess the maturity of the experience of applying an ROI evaluation process to projects in academic papers. Furthermore, these findings are also congruent with the initial argument that there are no antecedents or sufficient studies about the bibliometric analysis regarding the degree of maturity of the adoption of ROI methodologies in projects from an academic perspective, since we only retrieved 42 documents, which were published in a 5-year period (2017-2021).

However, considering all the authors that were mentioned in the literature review section (Section 2), it seems quite strange that there are few bibliometric studies about the use of ROI methodologies, especially because several authors have been using this tool as an important financial measure, constituting a wider corpus to be analyzed in such bibliometric studies (Flesher & Previts, 2013; Esmaeel et al., 2018; Fajardy & Mac Dowell, 2018; Klene et al., 2018; Kristjansdottir et al., 2018; Asare, 2019; Hou et al., 2019; Krizanova et al., 2019; Latiffi & Tai, 2019; Michopoulou & Moisa, 2019; Moreno et al., 2019; Rangkuti, 2019; Lee & Lee, 2020; Nofiana & Sunarsi, 2020; Tran et al., 2020; Valdivia et al., 2020; Jin et al., 2021; Nakash & Bouhnik, 2021; Stranieri et al., 2021).

In other words, ROI became a very popular investment analysis measure since it was developed to measure profits and guide decisions with views to demonstrating whether an investment is economically viable, being applied to several institutions, contexts, and countries since it was first introduced. Overall, almost every mentioned author demonstrated the pertinence of using ROI as an investment analysis measure, which is why it is broadly used throughout the world and for almost every single project/business/organization. Therefore, it would be expected that such important measure would be more frequently assessed in bibliometric analyses, which seems to contradict such popularity and widespread use, given its negligence from an academic perspective.

For that reason, future studies should focus on this aspect, developing more bibliometric analyses of ROI as an investment analysis measure with different limits in terms of time and scope, possibly assessing the published documents since the concept was firstly introduced up until now with the corresponding evolution through time.

## **Conclusion**

The number of documents mentioning ROI in the past five years suffered a sudden decrease in 2019 for then to curiously reach a peak in the following year. The most relevant conclusions to take are that the USA, followed by South Africa, are the two countries that have the highest number of publications using ROI (but that is understandable since the sample was filtered by language); and the most used publication type of document is the article (over 70%). According to our own interpretation, we can extrapolate many different things from the data in this sample, but the Covid-19 pandemic might surely have affected at least the second half of the past 5 years of this analysis.

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## **Annexes**

### **Annex A**

#### **SAP ERP vs. SAP S/4HANA: Comparison Results**

Compared to SAP S/4HANA, SAP ERP offers very similar support for the 3,539 decision criteria that make up the eight domains in the ERP comparison matrix, regardless of how those functions are offered (e.g., "off the shelf", via an integrated partner solution, add-ons, etc.). Let us take a closer look at the eight modules.

##### **1. Financials**

With regard to Financials functions and features, the comparison revealed that SAP ERP and SAP S/4HANA offer essentially an equal coverage.

##### **2. Human Resources**

Here we see that SAP S/4HANA has a slim advantage over SAP ERP in terms of Human Resources functionalities. In this module, SAP S/4HANA excels in functionalities which are provided out of the box.

##### **3. Manufacturing Management**

The two software solutions support an equal level of coverage of Manufacturing Management features and functions.

##### **4. Inventory Management**

Both SAP ERP and SAP S/4HANA provide nearly the same support for Inventory Management capabilities, be they supplied by modification or customization, thanks to a third-party system, or even offered natively.

##### **5. Purchasing Management**

In terms of Purchasing Management features and functions, both packages offer corresponding coverage.

##### **6. Quality Management**

Just like the preceding module, neither software suite stands out here. Both SAP ERP and SAP S/4HANA offer almost the same coverage of capabilities related to Quality Management.

##### **7. Sales Management**

With regard to the Sales Management module, SAP ERP somewhat outranks SAP S/4HANA, excelling in functions and characteristics which are offered natively.



## **8. Product Technology**

In terms of Product Technology characteristics and functions, neither software outranks the other; both receive a comparable score.

Do not forget that the product comparison report is driven purely by data. It does not account for a company's individual requirements nor factors that can affect the price and implementation cost of SAP ERP or SAP S/4HANA.

### **Conclusion**

In short, it is tough to ascertain which software package is the clear winner when comparing SAP ERP vs. SAP S/4HANA. Although the above overview may seem to advocate SAP ERP over SAP S/4HANA, do not forget that the analysis was done from a solely functional stance. Ultimately, software implementation can be affected by many factors, such as risk, duration, scalability, and cost. The above points only outline some areas that potential buyers can use to evaluate their software options.

## Major differences between SAP ECC and SAP S/4HANA

### 14 Major Differences between SAP ECC and SAP S/4HANA

