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Guidelines for alignment of sustainability with integrated management systems in industrial companies

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Guidelines for alignment of sustainability with integrated management systems in industrial companies

Diretrizes para alinhamento da sustentabilidade com sistemas de gestão integrados em empresas industriais

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"Whatever you do, work at it with all your heart..."

Colossians 3:23

ABSTRACT

Industrial companies impact not only the environment, but also in different dimensions of human life. Wealth gap, depletion of natural resources, pollutant emissions, improper working conditions are just some examples of the negative impacts from industrial activity. In this context, sustainable development practices are gaining strength in the industrial scenario in terms of combining the protection of the environment and the human being with gain of competitive advantage on the market, increasing therefore its long-term survival probability. The alignment of sustainability with the integrated management systems (IMSs) has been, albeit timidly, approached in the scientific literature as a viable alternative to introduce socio-environmental actions effectively in organizations. Based on this, the main objective of this research is to propose, in light of scientific theory and based on 7 case studies, guidelines for aligning sustainability with IMS in industrial companies. The research accomplishment has followed five main steps: 1) Development of the theoretical framework, 2) Systematization of the pillars of IMS and Corporate Sustainability (CS); 3) Conduction of 2 case studies in Brazil, 2 in Portugal and 3 in Spain, 4) Formulation of the guidelines, and 5) Conclusion and final draft of the thesis. The systematization of the pillars and elements of CS and IMS represents a dialogue towards unifying a starting point for researchers and practitioners in their respective fields. The crossing of the CS principles with those of the IMS made it possible to identify the relationships (synergies and dissonances) between both themes. The synergistic and dissonant elements that can positively or negatively impact the alignment of CS with the IMS served as the basis for proposing the guidelines to build a bridge for CS development from the IMS. This work brought as a scientific contribution the upgrade of the block of knowledge on the contributions of IMS to CS and *vice-versa*, bringing some validation of knowledge from scientific articles in the real context of industrial companies, and additions and refinements to the state of the art on the subject. In addition, the applied contribution of the results stands out, which will provide managers with a framework to intervene in organizations with structural modifications that will make them greener, socially appropriate and more profitable, thus promoting the achievement of the global goals of sustainable development proposed in Agenda 2030.

KEYWORDS: Corporate sustainability. Social impact. Management systems. Sustainable management. Integrated management systems. Industrial companies.

RESUMO

As empresas industriais impactam não somente o meio ambiente, mas também diversas dimensões da vida humana. Disparidade de riqueza, esgotamento dos recursos naturais e emissão de poluentes são apenas alguns dos exemplos de impactos negativos, de difícil recuperação/reversão resultantes da atividade industrial. É nesse contexto que as práticas de desenvolvimento sustentável ganham força no cenário industrial em função de aliar a proteção do meio ambiente e do ser humano ao ganho de diferencial competitivo das empresas, aumentando, portanto, sua probabilidade de sobrevivência a longo prazo. O alinhamento da sustentabilidade com os sistemas de gestão integrados (SGIs) vem sendo, ainda que timidamente, abordado na literatura científica como uma alternativa viável para introduzir ações socioambientais efetivamente em prática nas organizações. Com base nisso, o principal objetivo desta pesquisa é propor, à luz da teoria científica e com base em 7 estudos de caso, diretrizes para alinhamento da sustentabilidade com os SGIs em empresas industriais. A realização desta pesquisa está se dando em cinco etapas principais: 1) Desenvolvimento do referencial teórico, 2) Sistematização dos pilares Sustentabilidade Empresarial (SE) e do SGI; 3) Realização de 2 estudos de caso no Brasil, 2 em Portugal e 3 na Espanha, 4) Formulação das diretrizes e 5) Conclusão e redação final da tese. O objetivo principal foi alcançado por meio da identificação de elementos sinérgicos e dissonantes que podem impactar positivamente ou negativamente no alinhamento da sustentabilidade com o SGI. Tais elementos foram identificados na literatura e verificados nos estudos de caso, servindo como base para proposição das diretrizes para alinhamento da sustentabilidade com o SGI. Este trabalho trouxe como contribuição científica a atualização do bloco de conhecimento sobre as contribuições do SGI para a sustentabilidade e *vice-versa*, trazendo algumas validações de conhecimentos de artigos científicos no contexto real de empresas industriais, e acréscimos e refinamentos ao estado da arte sobre o tema. Além disso, destaca-se a contribuição aplicada dos resultados, que proporcionarão aos gestores um arcabouço para intervir nas organizações com modificações estruturais que as tornem mais verdes, socialmente adequadas e mais rentáveis, promovendo assim o alcance dos objetivos globais de desenvolvimento sustentável propostos na Agenda 2030.

PALAVRAS-CHAVE: Sustentabilidade corporativa. Impacto social. Sistemas de gestão. Gestão sustentável. Sistemas de gestão integrados. Empresas industriais.

LIST OF FIGURES

Figure 1 - Worldwide distribution of responsible investors..... 23
Figure 2 - Classification of research 30
Figure 3 - General flow of the research..... 31
Figure 4 - Thesis main-body structure..... 34
Figure 5 - Triple Helix model..... 39
Figure 6 - Methodological flow of the research..... 42
Figure 7 - Evolution of CS publications over the years..... 45
Figure 8 - Top three Universities and Funding Agencies..... 48
Figure 9 - Evolution of the participation of the research subgroups 55
Figure 10 - Timeline overview..... 56
Figure 11 - Countries with more "Global Compact" signatory institutions…..... 59
Figure 12 - Top ten countries that most registered patents for CS in the last 20 years…..... 66
Figure 13 - Top ten technological domains of CS patentes..... 67
Figure 14 - Research methodology flow bibliometrics IMS..... 84
Figure 15 - Article distribution by year of publication..... 85
Figure 16 - IMS articles by subject área..... 86
Figure 17 - Types of research..... 86
Figure 18 - Keyword density cloud..... 88
Figure 19 - Network of countries/territories..... 88
Figure 20 - Articles published per year by top 10 countries..... 91
Figure 21 - Pareto chart of citations by article..... 92
Figure 22 - Co-authorship network of top 10 authors..... 98
Figure 23 - Gaps and suggestions for future research.....99
Figure 24 - Methodological flow CS Pillars..... 109
Figure 25 - Frequencies of CS elements in the sample..... 114
Figure 26 - Proposed framework for CS management pillars..... 117
Figure 27 - Methodological flow IMS Pillars.....143
Figure 28 - Main elements for implementation and use of IMS..... 149
Figure 29 - Systematization of the principles of IMS..... 150
Figure 30 - Principles of IMS..... 151
Figure 31 - Continuous improvement cycle..... 158
Figure 32 - Methodological flow of the research..... 167
Figure 33 - Elaboration of the Framework..... 169
Figure 34 - Guidelines for CS alignment with IMS..... 175

LIST OF TABLES

Table 1 - MS Standard Certifications.....26
Table 2 - Search criteria.....43
Table 3 - Top three authors.....46
Table 4 - Top three countries.....47
Table 5 - Top journals.....51
Table 6 - Hot topics.....52
Table 7 - Participation of the hot topics in the analyzed articles.....54
Table 8 - Countries in the Dow Jones Sustainability Index.....63
Table 9 - Companies listed on the DJSI that registered the most patentes.....68
Table 10 - Framework for CS development.....70
Table 11 - Article distribution by jornal.....86
Table 12 - Classification and details of empirical studies.....88
Table 13 - Top 10 countries IMS.....89
Table 14 - 10 most cited articles on IMS.....94
Table 15 - Topics approached by top 10 articles.....95
Table 16 - Top 10 authors IMS.....97
Table 17 - Literature reviews in CS published between 2015 and 2018.....108
Table 18 - CS elements and systematization of the management pillars.....115
Table 19 - Management standards, guidelines, and regulations covering TBL.....129
Table 20 - IMS models and their respective theoretical and conceptual basis.....138
Table 21 - Set of principles cited in IMS studies.....141
Table 22 - General characterization of the studied companies.....170
Table 23 - Systems that compose the IMS of the studied companies….....171

LIST OF ABBREVIATIONS AND ACRONYMS

BS	Business Sustainability
BSI	British Standards Institution
CAPES	Coordination for the Improvement of Higher Education Personnel
CNPq	Brazilian National Council for Scientific and Technological Development
CP	Cleaner Production
CS	Corporate Sustainability
CSA	Corporate Sustainability Assessment
CSF	Critical Success Factor
CSR	Corporate Social Responsibility
CSRMS	Corporate Social Responsibility Management System
CSP	Corporate Sustainability Performance
DJSI	Dow Jones Sustainability Index
EFQM	European Foundation for Quality Management
ERP	Enterprise Resource Planning
FAPESP	São Paulo Research Foundation
GD	Green Design
GDP	Gross Domestic Product
GRI	Global Reporting Initiative
GSM	Green Supply Chain Management
INMETRO	National Institute of Metrology, Standardization and Industrial Quality
IMS	Integrated Management System
ISO	International Organization for Standardization
ISE	Corporate Sustainability Index
LCA	Life Cycle Assessment
MS	Management System
OHSMS	Occupational Health and Safety Management Systems
PAS	Publicly Available Specification
PRI	Principles for Responsible Investment
SAAS	Accountability Accreditation Services
SQC	Statistical Quality Control
SPMS	Sustainability performance evaluation system
TBL	Triple-Bottom-Line
TQM	Total Productive Maintenance
TS	Technical Specifications
UNGC	United Nations Global Compact
UNESP	Sao Paulo State University “Júlio de Mesquita Filho”
WBCSD	World Business Council for Sustainable Development

SUMMARY

1 INTRODUCTION 15
1.1 OBJECTIVES 19
1.2 RESEARCH DELIMITATION 21
1.3 RESEARCH JUSTIFICATION 21
1.4 RESEARCH METHOD 28
1.4.1 Classification of research 29
1.4.2 Methodological flow 31
1.4.3 Thesis main-body structure 34
2 WHERE TO GO WITH CORPORATE SUSTAINABILITY? OPENING PATHS FOR SUSTAINABLE BUSINESSES THROUGH THE COLLABORATION BETWEEN UNIVERSITIES, GOVERNMENTS, AND ORGANIZATIONS 36
2.1 INTRODUCTION 36
2.2 RESEARCH METHOD 40
2.3 SCIENTIFIC-TECHNICAL SCENARIO 44
2.3.1 Scientific scenario 45
2.3.1.1 Maturity level of scientific development 45
2.3.1.2 Major authors 46
2.3.1.3 Scientific Government Efforts 47
2.3.1.4 Major scientific journals 50
2.3.1.5 Hot Topics and Timeline overview 52
2.3.2 Technical scenario 58
2.3.2.1 World Economic Forum 58
2.3.2.2 Global Compact and SDGs 59
2.3.2.3 Global Reporting Initiative 60
2.3.2.4 Dow Jones Sustainability Index 61
2.3.2.5 Technical government efforts 63
2.3.2.6 Patents and innovations for CS development 65
2.4 CORPORATE SUSTAINABILITY FRAMEWORK 69
2.5 CONCLUSIONS 74
3 ANALYSIS OF INTEGRATED MANAGEMENT SYSTEMS RESEARCH: IDENTIFYING CORE THEMES AND TRENDS FOR FUTURE STUDIES 77
3.1 INTRODUCTION 77
3.2 THEORETICAL FRAMEWORK 78
3.2.1 Certifiable Management Systems 78
3.2.2 Integrated Management Systems 80

3.3 RESEARCH METHOD 82
3.4 RESULTS AND DISCUSSIONS 85
3.5 CONCLUSIONS 100
4 RETHINKING THE WAY OF DOING BUSINESS: A REFRAME OF MANAGEMENT STRUCTURES FOR DEVELOPING CORPORATE SUSTAINABILITY 102
4.1 INTRODUCTION 102
4.2 THEORETICAL BACKGROUND ON CORPORATE SUSTAINABILITY MANAGEMENT 104
4.3 RESEARCH METHOD 108
4.4 RESULTS AND DISCUSSIONS 113
4.4.1 Sustainable Corporate Governance 117
4.4.2 Corporate Sustainability Strategy 119
4.4.3 Sustainable Management of Human Resources 121
4.4.4 Sustainable Knowledge and Innovation Management 123
4.4.5 Measurement, Disclosure, and Independent Assurance of Corporate Sustainability 124
4.4.6 Sustainable Management Systems and Integrated Management Systems 126
4.5 CONCLUSIONS 131
5 GUIDING PRINCIPLES OF INTEGRATED MANAGEMENT SYSTEMS: TOWARDS UNIFYING A STARTING POINT FOR RESEARCHERS AND PRACTITIONERS 133
5.1 INTRODUCTION 133
5.2 LITERATURE REVIEW ON INTEGRATED MANAGEMENT SYSTEMS 135
5.3 RESEARCH METHOD 142
5.4 RESULTS AND DISCUSSIONS 148
5.4.1 Pillar 2: Standardization 152
5.4.2 Pillar 3: Integration 153
5.4.3 Pillar 4: Organizational Learning 155
5.4.4 Pillar 5: Debureaucratization 156
5.4.5 Pillar 6: Continuous improvement 157
5.5 CONCLUSIONS 160
6 OPENING NEW PATHS TO CROSS THE BRIDGE BETWEEN SUSTAINABILITY AND INTEGRATED MANAGEMENT SYSTEMS: COMBINED CONTRIBUTIONS FROM ACADEMIA AND IBEROAMERICAN INDUSTRIAL COMPANIES 163
6.1 INTRODUCTION 163
6.2 RESEARCH METHOD 166

6.3 RESULTS AND DISCUSSIONS 169
6.3.1 Characterization of the studied companies 169
6.3.2 Synergies and dissonances between CS and IMS: Cross-analyses and discussions 172
6.4 GUIDELINES FOR ALIGNMENT OF SUSTAINABILITY WITH INTEGRATED MANAGEMENT SYSTEMS 175
6.4.1 Managing resources and demands of CS and IMS in a systemic and integrated way 175
6.4.2 Defining strategies to identify and engage stakeholders with CS 176
6.4.3 Developing an integrated approach for risk analysis 177
6.4.4 Monitoring of legal requirements and international CS agreements 178
6.4.5 Including CS in the purpose, mission and vision of the organization using IMS as a tool for its integration in the processes 178
6.4.6 Developing resolution strategies for tensions between CS and IMS 179
6.4.7 Integrating innovation management with IMS 179
6.4.8 Raising employee awareness of the added value of CS 180
6.4.9 Creating routines to develop CS into processes through IMS standardization 181
6.4.10 Expanding the scope of IMS to the value chain 181
6.5 CONCLUSIONS 182
7 CONCLUSIONS OF THE THESIS 184
REFERENCES 187
APPENDIX A – 30 MOST-CITED ARTICLES CS (1999-2018) BIBLIOMETRICS 212
APPENDIX B – 30 MOST-CITED ARTICLES CS (2007-2017) PILLARS 215
APPENDIX C – ELEMENTS OF CS AND FREQUENCY OF OCCURRENCE 237
APPENDIX D – THE 30 MOST CITED ARTICLES IN IMS FROM 2006 TO 2016 227
APPENDIX E – ELEMENTS OF IMS AND FREQUENCY OF OCCURRENCE 230
APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES 233

1 INTRODUCTION

The planet has begun to show signs that it will not support human development in the way it is occurring. The consumption levels of goods and services are rising fastest, thus proportionally generating more pollution and waste without ensuring that the benefits of globalization are shared by all (MILNE; GRAY, 2013a). Despite its benefits to the world economy, the globalization process has caused a series of damages to the environment and to social welfare due to the concentration and intensification of productive activity in regions with a poor legislation and culture of environmental protection, increased exploitation of labor, etc. (GILAL et al., 2019; MILNE; GRAY, 2013a).

Amidst this scenario, companies have been increasingly pressured to integrate a sustainable posture into their daily strategies and practices and to disclose their impacts and mitigation actions aimed at sustainable development. This has been even more evident in industrial companies (DELAI; TAKAHASHI, 2013; GILAL et al., 2019; GOVINDAN; KHODAVERDI; JAFARIAN, 2013; LOZANO, 2015).

Industrial companies impact not only the environment, but also many dimensions of human life. Wealth gaps, depletion of natural resources and emission of pollutants are just some of the examples of negative impacts of difficult recovery/reversion resulting from industrial activity (LOZANO, 2015). The participation of Brazilian, Spanish and Portuguese industries in the Gross Domestic Product (GDP) of their respective countries has been declining since the 1990s (WORLD BANK, 2017).

Achieving global growth in the industrial sector involves overcoming the problems that undermine competitiveness and finding means to develop sustainable models of development (JESUS et al., 2019). All this added to the increased competitiveness and regulatory pressures has led sustainable development practices gain strength in the industrial scenario, because they increase the company's probability of survival in the long-term (DRAGOMIR et al., 2019; HOLTON; GLASS; PRICE, 2010).

Sustainability or sustainable development is a set of actions/initiatives that meet the demands of the current generation without compromising the capacity to meet the needs of future generations (WCED, 1987). It concerns instructions and guidelines that promote the preservation of the environment and the human being, such as the incentive and direction of investments and technological development for the preservation of the environment and of the population, the exploitation and conscious use of natural and human resources, etc. (NICOLĂESCU; ALPOPI; ZAHARIA, 2015).

In the business context, the adoption of sustainability goes beyond mere marketing work. It aims to establish management and measurement methods to continuously improve the performance of its three main pillars: social, environmental and economic (ASIF; SEARCY, 2014; HOLTON; GLASS; PRICE, 2010).

Corporate sustainability (CS) is dynamic and commonly operationalized from the Triple-Bottom-Line (TBL), a mechanism that contemplates the three pillars aforementioned, from perspectives that include planet, profit and people in a balanced way in the strategies and operations of organizations (ASIF; SEARCY, 2014; GIMENEZ; SIERRA; RODON, 2012; LOZANO, 2015).

At first, industry engagement with sustainable development was focused on understanding the meaning of sustainability and its possible implications for the industry. Over time, a growing part of industrial companies have begun to raising awareness not only about its meaning, but also about the need to act effectively in this regard (UNEP-FI, 2016).

Pressured by society, governments, laws, end customers and other stakeholders, more and more companies are looking for different alternatives for the development of sustainable practices (DRAGOMIR et al., 2019; JESUS et al., 2019; LOZANO, 2015). According to the United Nations Global Compact (UNCG), in 2020 almost 14000 companies in 160 countries have taken part in the Global Compact, the largest CS initiative in the world, aimed at helping companies operate more sustainably. This number has increased by 75% since 2015, when the number of UNGC signatory companies was 8000 (UNGC, 2020a).

It is likely that this concern to develop, measure and report on sustainability will continue to increase, despite the evidences of difficulties companies have faced to in order to do so (CHASSE; BOIRAL, 2016; LONGONI; CAGLIANO, 2016). In this sense, it should be noted that the lack of connection between orientation and practice is a complicating factor for companies that seek to develop and disseminate their actions towards sustainability (FONSECA; MCALLISTER; FITZPATRICK, 2012).

This is because companies often have little experience in developing practices and reporting on their performance in sustainability, do not know and/or have adequate data collection methods, do not have the skills to publish detailed reports, etc. (BOIRAL; HENRI, 2017; DIOUF; BOIRAL, 2017).

The Global Reporting Initiative (GRI) is an international organization that helps companies understand and communicate the impacts of their activities on the planet's sustainability. Its main contribution is to guide companies to develop and promote reports on

this topic, stimulating the practice of transparency on actions taken in the areas of the TBL (GRI, 2020a).

According to GRI, it is possible to improve CS performance by improving the balance, comparability, accuracy, punctuality, clarity and reliability of the information disclosed (DIOUF; BOIRAL, 2017).

To meet these demands, a series of efforts have been expended in the creation of technical and managerial solutions to conciliate and foster environmental, economic and social development in an equitable way (ASIF; SEARCY, 2014; DELAI; TAKAHASHI, 2013; SIEW, 2015). In this sense, it is worth emphasizing that several guidelines, indexes, standards and best practices of sustainable development were created around the world. The set of GRI standards stands out as the most used tool to guide sustainability disclosure worldwide (ANHOLON et al., 2016; GRI, 2018).

It is also important to highlight green initiatives related to the elements of business management, such as the development of Cleaner Production (CP) programs; Green Supply Chain Management (GSM); Green Design (GD); Life Cycle Assessment (LCA); and Integrated Management System (IMS) based on normative standards such as ISO 9001 (Quality Management System - QMS), ISO 14001 (Environmental Management System - EMS), OHSAS 18001 and ISO 45001 (Occupational Health and Safety Management System – OHSMS) and ISO 26000 and SA8000 (both for Corporate Social Responsibility - CSR) (ASIF; SEARCY, 2014; KURDVE et al., 2014; NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016; SIEW, 2015).

The IMS, one of the two focuses of this study together with sustainability, aims at enhancing the synergies and minimizing possible incongruities and dissonances between the various systems that comprise it, in order to avoid duplication of tasks and optimize the use of common elements by placing them to work together and in an aligned way, resulting in a more efficient and effective IMS (NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016; OLIVEIRA, 2013).

Among the benefits that organizations can achieve through the implementation and use of IMSs are the improvement of organizational efficiency (reduced redundancy of tasks, human efforts, time, etc.), improvement of internal communication, corporate image, competitiveness, as well as the reduction of the management costs of each system individually (ABAD; DALMAU; VILAJOSANA, 2014; OLIVEIRA, 2013).

The integration of management systems (MSs) has been studied primarily as the fusion between QMSs, EMSs, OHSMSs, CSRMSs, among others, with emphasis on the first three ones (REBELO; SANTOS; SILVA, 2014a).

This emphasis is mainly due to the popularization of ISO 9001 (QMS), ISO 14001 (EMS) and OHSAS 18001 (OHSMS), which are currently the most widely used by companies worldwide (NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016; REBELO; SANTOS; SILVA, 2014a). It is worth noting that at each new revision of these three standards the compatibility between them, that is based on the PDCA (Plan, Do, Check and Act) cycle of continuous improvement, is purposely increasing, being this an important factor in the alignment and integration process of the systems (OLIVEIRA, 2013; SATOLO; CALARGE; CAUCHICK MIGUEL, 2013).

In addition, the publication of Annex SL by ISO in 2015 has come to consolidate the alignment of the various standards of existing MSs. This means that the structure of Annex SL can be applied not only to ISO standards, but also to the Publicly Available Specification (PAS), to the Technical Specifications (TS), among others, thus encouraging the expansion of the scope of integrated management beyond the areas of quality, environment and occupational health and safety, making the integration more comprehensive and flexible (BSI, 2016; ISO, 2018; NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016).

The alignment of sustainability with the IMSs was in 2016 timidly approached in the scientific literature as a viable alternative to effectively put into practice sustainability in organizations. At the beginning of this research the joint study of sustainability and IMSs was relatively recent and further scientific research and applications were still lacking (JORGENSEN, 2008; REBELO; SANTOS; SILVA, 2016; SIVA et al., 2016).

This research enabled to explore and contribute to fill the scientific gaps related to this topic, of which the following stand out: a) how IMS can contribute to facilitate sustainability development and vice versa (GIANNI; GOTZAMANI, 2015); b) how to develop, from IMSs perspective, sustainable competitive advantage(SAVINO; BATBAATAR, 2015); and how the alignment of sustainability with IMS can take place in practice so that one can, in a structured way, proceed with the state of the art on the alignment of sustainability with IMSs (WITJES; VERMEULEN; CRAMER, 2017).

These gaps, among others, were identified, analyzed and synthesized by this student and her supervisor in the published article "Evolution of Integrated Management Systems Research on the Journal of Cleaner Production: Identification of Contributions and Gaps in the Literature" (NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016). Over the years of development of

this study, the articles resulting from this work have contributed scientifically to updating the knowledge block on the relations between IMS and sustainability, with additions and improvements to the state of the art in the subject (bibliometrics, systematization of elements and pillars, guidelines frameworks), as shown throughout the chapters of this thesis.

On the basis of the above, the research question that will guide the development of this study is the following: in what way is it possible to align sustainability with IMS in industrial companies in order to generate competitive advantages, preserve the environment and respect the human being?

1.1 OBJECTIVES

The main objective of this research is to propose, in light of the scientific theory and 7 case studies, guidelines for the alignment of sustainability with IMSs, aiming to integrate principles, practices, procedures and documentation that involves the objects of study to promote business competitiveness, the protection of the planet and the human well-being in an equitable way.

In this study, it is understood as alignment the establishment of a strategic and operational direction between the two objects of study (sustainability and IMSs) in order to increase the competitiveness of companies, together with the protection of the environment and the human being, in a way to generate environmental, social and economic benefits. The alignment can be achieved by integrating principles (also called pillars), practices (also called elements), procedures, and documentation concerning sustainability and IMSs to enhance their joint and integrated use.

It is understood that principles or pillars are the fundamental basis for the development and orientation of any discipline or element studied. In the case of this work, the principles of sustainability and IMSs will be raised, which obviously will contemplate the main principles of its subdisciplines, such as social responsibility, quality, environment and occupational health and safety.

Practices or elements are the means used to implement and develop the principles, such as using the PDCA cycle, forming quality teams, etc. Procedures include how to proceed to meet certain requirements, that is, it is the execution of the process, which involves, for example, procedures to sensitize internal and external collaborators, auditing procedures, documented procedures, etc.

The documentation controls the compliance with the procedures, processes and work instructions. Some examples are the documents related to the definition of policies and responsibilities, manuals, records, etc.

However, in order to perform the alignment, it is needed to study the synergic and dissonant elements between sustainability and IMSs, being the synergistic elements those that can be unified or aligned in order to contribute in parallel to the achievement of the goals and objectives of the environmental, social and economic areas; and the dissonant elements those that must be minimized in order to reduce their contrapositions.

Thus, based on the identification of synergies and dissonances, theoretical and applied, between the two objects of study (sustainability and IMS), guidelines will be developed (recommendations) to enhance the joint and integrated use of sustainability and IMS practices in industrial companies, in order to promote the sustainable business development and improving the competitiveness.

The alignment refers to the formulation of guidelines (recommendations) capable of unifying, potentializing and aligning the synergic elements and minimizing the antagonistic elements, directing the companies to obtain a sustainable competitive advantage.

The alignment will enable organizations to achieve their strategic goals from actions focused on the environment, workers and society, encompassing various dimensions and elements of sustainability and IMSs, such as investments, actions of sensitization, motivation, education and training, control, checks, information, documents, performance indicators, etc. in order to obtain greater confidence and satisfaction from the various stakeholders (owners, internal and external customers, companies, etc.).

The four specific objectives of the research are the following:

1. To map, based on bibliometric studies, the state-of the-art on CS and IMS, in order to find research gaps that justify the development of this thesis;
2. To establish, based on a systematic literature review, the principles and practices of CS and IMS;
3. To identify, from a theoretical cross analysis of the principles of CS and IMS, the existence of relationships (synergies and dissonances) between these two subjects;
4. To identify, from 7 case studies in industrial companies, the manner in which the relationships (synergies and dissonances) between CS and IMS occur.

1.2 RESEARCH DELIMITATION

This research is restricted (boundary conditions) to identify how CS relates and is aligned with IMS and vice-versa. The scope of analysis was also delimited in relation to the object of study (CS and IMSs), the productive sector (industrial companies); the characteristics of the companies (medium and large-sized companies, certified with at least two MSs, and that publish each year a sustainability report); and regarding the geographic focus (Ibero-American companies which operate in Brazil, Portugal and Spain).

1.3 RESEARCH JUSTIFICATION

The scientific relevance of this research was perceived with the accomplishment of an exploratory study carried out by the student and her supervisor (NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016). This study revealed that the relationship between IMSs and sustainability has aroused the interest of many scholars, who are increasingly suggesting researches that both widens and deepens the theme.

It was based on this exploratory study that became clear the need for research on the impact of certifiable MSs (quality, environment, occupational health and safety, social responsibility, etc.) on the sustainable development of companies (and vice-versa), especially to those of the industrial sector (NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016; REBELO; SANTOS; SILVA, 2016; SIVA et al., 2016; WITJES; VERMEULEN; CRAMER, 2017).

Throughout this section, data and information extracted from international scientific literature and from internationally renowned institutions will be presented and discussed in order to justify the relevance of the development of this study. In order to facilitate the reader's understanding, it is clarified that first justifications about the importance of researching on CS are presented, then about the relevance of MSs and their integration and, finally, about the joint study of CS and IMS.

Organizations constantly face the challenge of dealing with the business scenario characterized by intense competitiveness, scarce natural resources, constant technological advances, new market demands and increasingly demanding customers who expect new products with high quality and favorable purchase prices. Such situation has driven organizations to adapt to market needs by making efforts, above all, to implement operational and managerial changes (NUNHES; BERNARDO; OLIVEIRA, 2019; OLIVEIRA, 2013).

Sustainability has become an especially important theme for the survival of organizations because, in light of the severe impacts of environmental degradation on the planet (changes in climate and demography, scarcity of natural resources, etc.) and the consequent impacts that their activities have on the development of society, business efforts have been made to enable a new "sustainable" economy viable (NUNHES; BERNARDO; OLIVEIRA, 2020). Reflecting this, the adoption of a strategy of development based on equality between economic, environmental and social dimensions has become a systemic challenge that involves companies and society in general (UNGC, 2020a) (UNGC, 2016).

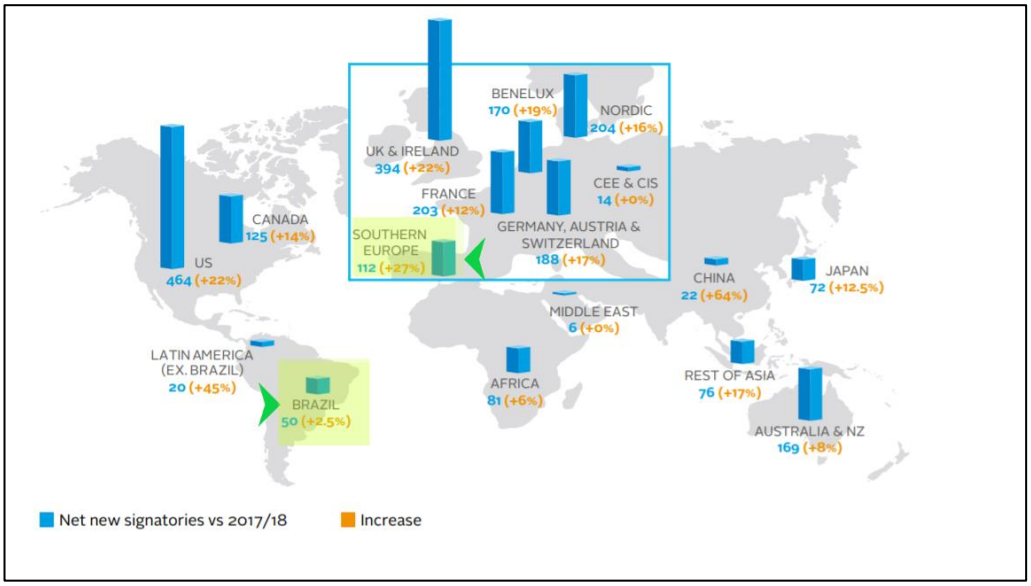
According to the bibliometric study on CS presented in chapter 2 of this thesis, the scientific production on CS was following a trend of linear growth until the year 2018, demonstrating that this is a hot topic in the international academic landscape.

The growing trend of investment in sustainable companies has also revealed a great deal of concern on the part of investors regarding the control and mitigation of environmental impacts and engagement with social practices (DISTERHEFT et al., 2012). The Principles for Responsible Investment (PRI) is an investor initiative in partnership with UNEP Finance Initiative and UN Global Compact that provides its signatories with guidance and support to develop their investments in a responsible manner, that is, contributing towards a sustainable business environment (PRI, 2019).

Figure 1shows the increasing number of responsible investors in 2018 according to the 2019 annual report of the PRI. Figure 1 indicates that the number of investors committed to sustainability has grown worldwide, reaching a more than 20% rise in 2017/2018, which represents the largest increase since 2010/2011(PRI, 2019).

More specifically, it is possible to observe that Brazil stands out in relation to other Latin American countries with a total of 50 new responsible investors and an increase of 2.5% in the analyzed period. In addition, the significant growth of 27% in the number of responsible investors in southern Europe between 2017/2018 is highlighted, totaling 112 new responsible investors (PRI, 2019).

Figure 1 - Worldwide distribution and increase in the number of responsible investors



Source: PRI (2019).

Corroborating this trend, Brazil, Portugal and Spain are among the countries that publish sustainability reports at a higher rate than the global average (72% - 89%), presenting in 2017 rates of 85% in Brazil, 80% in Portugal and 87% in Spain (KPMG, 2017).

Considering this and the fact that many international journals with a high impact factor encourage the publication of cross-country management research, it is believed that the chosen geographic delimitation (Brazil, Portugal and Spain) is of utmost importance to increase the relevance and novelty of the results of this doctoral research.

It is interesting to note that companies in Portugal and Spain that have an average of more than 500 employees are required by law (Directive No. 2014/95/EU) to present an annual non-financial statement (sustainability disclosure), integrated or not with the financial report (TALIENTO; FAVINO; NETTI, 2019). In the case of Brazil, despite presenting a high number of companies that annually report non-financial information, there is still no legislation in force about sustainability disclosure.

Therefore, the analysis of companies operating in Brazil, Portugal and Spain will allow to identify cultural and government policy differences that can positively or negatively impact the alignment of sustainability with the IMS.

The study presented in this thesis will be relevant for investors, who will be able to make of use the knowledge generated to outline their investment strategies, thus fostering timely and sustainable investments.

The results will also be important to guide company managers to develop a sustainable business management aligned with their existing management structures and, therefore, make companies more internationally competitive and more likely to survive in the long-term perspective.

The increased number of reports that integrate financial and non-financial information is a reality that reflects the importance of developing sustainable businesses (DIOUF; BOIRAL, 2017; FONSECA; MCALLISTER; FITZPATRICK, 2012). According to a survey conducted in 2017 by one of the world's leading consulting firms, more than 75% of the world's 250 largest companies have included non-financial information in their annual financial reports (KPMG, 2017).

In general, the large companies' activities have a significant impact on society and the environment, so they are pressured by various stakeholders to minimize their adverse effects on sustainability as much as possible (FEIL; DE QUEVEDO; SCHREIBER, 2017).

Therefore, the large companies are those that usually achieve external recognition of sustainability performance because they have to deliver on stakeholder expectations by demonstrating enhanced transparency including their equity in indexes such as the Dow Jones Sustainability Index (DJSI), BOVESPA´s[1] CS Index, Ethical Index Euro, STOXX Global ESG Leaders Index, ECPI, Vigeo, etc. (FEIL; DE QUEVEDO; SCHREIBER, 2017; TALIENTO; FAVINO; NETTI, 2019) and publishing sustainability reports (DIOUF; BOIRAL, 2017; ZSÓKA; VAJKAI, 2018) .

Although sustainability has begun to be developed in small companies, historically, medium and especially large companies started the journey toward CS and now have accumulated greater experience in this area (FEIL; DE QUEVEDO; SCHREIBER, 2017). Based on this, it is argued the conduction of case studies in medium and large companies with experience in sustainability disclosure will allow to identify best CS practices useful for dissemination in literature and in the business community.

When approaching CS, it is important to analyze the industrial sector, which is responsible for the greatest sources of pollution, depletion and degradation of environmental resources and threats to the health and safety of workers and citizens in general (FEIL; DE QUEVEDO; SCHREIBER, 2017).

The Brazilian, Spanish and Portuguese industries represent, respectively, 21.2%, 23.3% and 22.4% of the GDP of each country. Although these numbers are relatively significant, it

[1] São Paulo Stock Exchange.

should be noted that these percentages have been decreasing since the mid-1990s, when this share was around 40% in Brazil, 30.6% in Spain and 28% in Portugal (WORLD BANK, 2017).

The only way out of this critical situation and overcome the problems that undermine the competitiveness of the industry is to adapt companies to more sustainable production and consumption patterns in order to mitigate their impacts on society and the environment (FEIL; DE QUEVEDO; SCHREIBER, 2017; IEDI, 2016).

Despite the growing importance of CS in national and global terms, the scientific literature on how to put it into practice still needs further studies (ASIF; SEARCY, 2014). Some researchers suggest that IMSs are a viable solution for developing the elements of sustainability in organizations. For this reason, they point out that further studies on the contributions of IMSs to CS initiatives (and vice versa) should be carried out (NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016; SIVA et al., 2016; WITJES; VERMEULEN; CRAMER, 2017).

According to Santos et al. (2012), quality, environment and occupational health and safety are fundamental pillars for sustainable development. In addition, its systemic and effective management enhances competitiveness and stakeholder satisfaction. Sampaio, Saraiva and Domingues (2012) argue that the development of quality, good environmental practices, as well as the promotion of health and safety among employees must be carried out in an integrated manner.

At this point, it is emphasized that the relationship of the IMSs with sustainability is being increasingly noticed; however, it usually appears indirectly and subjectively (NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016; SOUZA; ALVES, 2016). In this way, the present study will allow a more direct and in-depth identification of the relationships between the sustainability pillars and the IMS.

IMSs have emerged for the purpose of developing a single and more efficient MS which, through the integration of common elements into two or more MSs, reduces bureaucracy and allows a better use of time and human, financial and technical resources (ABAD; DALMAU; VILAJOSANA, 2014; OLIVEIRA, 2013).

The bibliometric study on IMS presented in chapter 3 of this thesis shows that since 2010 there has been a significant increase in the number of publications on IMS, reaching a growth rate of approximately 135% between 2010 and 2015 (NUNHES; OLIVEIRA, 2018). A possible consolidation of the relevance of IMS followed shortly after, in 2015, with the publication of new versions of ISO 9001 and ISO 14001 in accordance with Annex SL, the common structure of ISO MSs that favors integration (DOMINGUES et al., 2016b).

Bernardo et al. (2012) pointed out that the number of organizations that are implementing various MSs in order to meet stakeholder requirements and achieve maximum efficiency is increasing. This fact is related to the increased interest in the integration of MSs, after all, the greater the number of MSs sharing the same philosophy, the greater the search for the their simplification and integration (DOMINGUES et al., 2016b; DRAGOMIR et al., 2019).

With worldwide application, the main certifications adopted by companies to manage, respectively, quality, environment and occupational health and safety are ISO 9001, ISO 14001, OHSAS 18001. In addition, the increased social focus on organizations, for example, has led companies to adopt initiatives such as ISO 26000 and SA8000 to include social elements in their MSs (SAVINO; BATBAATAR, 2015).

To have an idea of the use of MSs in companies around the world, Table 1 presents the number of some main certified MSs, focusing specifically on showing its use in Brazil, Portugal and Spain because of the delimitation of this study.

Table 1 - MS Standard Certifications

Subject	Standard	Survey's year	Global certificates	Brazil	Portugal	Spain
Quality management systems	ISO 9001	2018	878 664	16351	6623	29562
Environmental management systems	ISO 14001	2018	307 059	2871	1382	12198
Information security management system	ISO IEC 27001	2018	31 910	110	85	726
Occupational health and safety management systems	OHSAS 18001	2011 (Global) 2014 (Brazil and Portugal)	92 315	834	1121	-
	ISO 45001	2018	11 952	32	127	138
Social Accountability	SA8000	2019	9081	17	33	14
Energy management systems	ISO 50001	2018	18 059	62	53	603
Anti-bribery management systems	ISO 37001	2018	389	12	-	25

Source: Adapted from Domingues; Sampaio; Saraiva (2015); ISO Survey (2019); Revista Proteção (2015); BSI (2011) and SAAS (2016).

As can be seen from Table 1, the International Organization for Standardization (ISO) and the Social Accountability Accreditation Services (SAAS) annually disclose data on the diffusion of the number of various MSs certifications classified by countries and regions. The British Standards Institution (BSI) group did not provide public databases on the diffusion of

OHSAS 18001, so the available data regarding this certification is quite limited. However, with the migration from OHSAS 18001 to ISO 45001, future ISO's studies are expected to include the diffusion of certified occupational health and safety MSs.

Although the number of certified MS in 2018 is significant, it should be noted that this number is gradually decreasing when it comes to the traditional ISO 9001. Some authors suggest that this trend can be explained because once the MS is well implemented and generating results and the market does not require recertification, companies choose to avoid certification-related costs but maintain it operating according to the requirements of the MS standard (BERNARDO; SIMON, 2014; KAFEL; SIMON, 2017).

Regardless of whether they are certified or not, implementing multiple MSs has been the choice of many managers to meet the needs of their stakeholders (FONSECA; CARVALHO, 2019). This can explain why companies more advanced with sustainability often have more certified MSs (FONSECA; CARVALHO, 2019; GIANNI; GOTZAMANI; TSIOTRAS, 2017).

Despite this, the information, elements and practices of these MSs are not adequately used to leverage sustainability in organizations (WITJES; VERMEULEN; CRAMER, 2017). The bibliometric studies carried out for developing this research have indicated that the relationship between CS and IMS is still at an early stage and that future studies could better explore the relationships between these two constructs (NUNHES; OLIVEIRA, 2018; NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016).

In view of the foregoing, this research will allow to identify in the relevant scientific literature and in industrial companies from different countries the main best practices and difficulties of developing CS and IMSs (such as ISO 9001, ISO 14001, OHSAS 18001, SA8000, ISO 26000) in its individual and integrated forms.

This contribution is especially remarkable if one considers that there is a shortage of research presenting comparative analyses between different countries on the implementation and development of IMS (BERNARDO et al., 2017) and CS (MIRAS-RODR; MART, 2018).

In addition, many authors have suggested researches to alleviate the misalignment of the conceptual bases in management fields such as CS and IMS (ECCLES; IOANNOU; SERAFEIM, 2014; MONTIEL; DELGADO-CEBALLOS, 2014a). Due to different scientific starting points and the use of disconnected conceptual bases, many studies have lost the opportunity to achieve more synergistic results and contribute for the advancement of the state-of-the-art. This justify the importance of systematizing the pillars of CS and IMS (NUNHES; BERNARDO; OLIVEIRA, 2020, 2019), which contributed to the homogenization of their respective theoretical bases.

This research will also allow to investigate, through the conduction of multiple case studies, how IMSs and/or individually certified MSs can relate to sustainability practices. The identification of theoretical and applied synergies and dissonances between CS and IMS will provide a sound basis to develop the guidelines for aligning sustainability with IMSs.

In this way, this research will contribute to the scientific literature that relates sustainability and IMSs (scientific contribution), identifying the benefits and difficulties of implementing each one separately and the synergies and dissonances between the two.

This knowledge will be used to support the elaboration of the guidelines for alignment of sustainability with IMSs in industrial companies, which will contemplate a set of actions that can be used directly by the organizations and characterizes the main applied contribution of this study.

It is expected that all the results obtained with this doctoral research (guidelines and other partial results – bibliometric studies on CS and IMS, systematization of principles of CS and IMS, and identification of synergies and dissonances between CS and IMS) to be disseminated in several countries and research institutions through the elaboration of scientific articles to be published, preferably, in journals with high impact factor/*qualis*.

Throughout the development of this research, partnerships were established with external researchers from Brazil and other countries. The partnerships with researches from Portugal and Spain were consolidated through FAPESP processes nº 2017/18304-7 and 2018/17537-0 and Sweden through FAPESP process nº 2017/18304-7.

Therefore, another memorable contribution would be the consolidation of the partnership between FEG-UNESP and Polytechnic Institute of Cavado and Ave and University of Minho (Portugal), University of Barcelona (Spain) and Uppsala University-Campus Gotland (Sweden), which could open doors for the development of other future research projects.

With this work, it is also expected to contribute to the development of the "Operations Management" area of the academic master in Production Engineering and the "Management and optimization" area of the doctorate/master in Mechanical Engineering, both postgraduate programs from FEG/UNESP. Also, it is expected to contribute with the formation, direct and indirect, of human resources in the theme (professors-researchers, doctoral students, master's students and students of scientific initiation), which will probably become multipliers of knowledge generated through this research.

1.4 RESEARCH METHOD

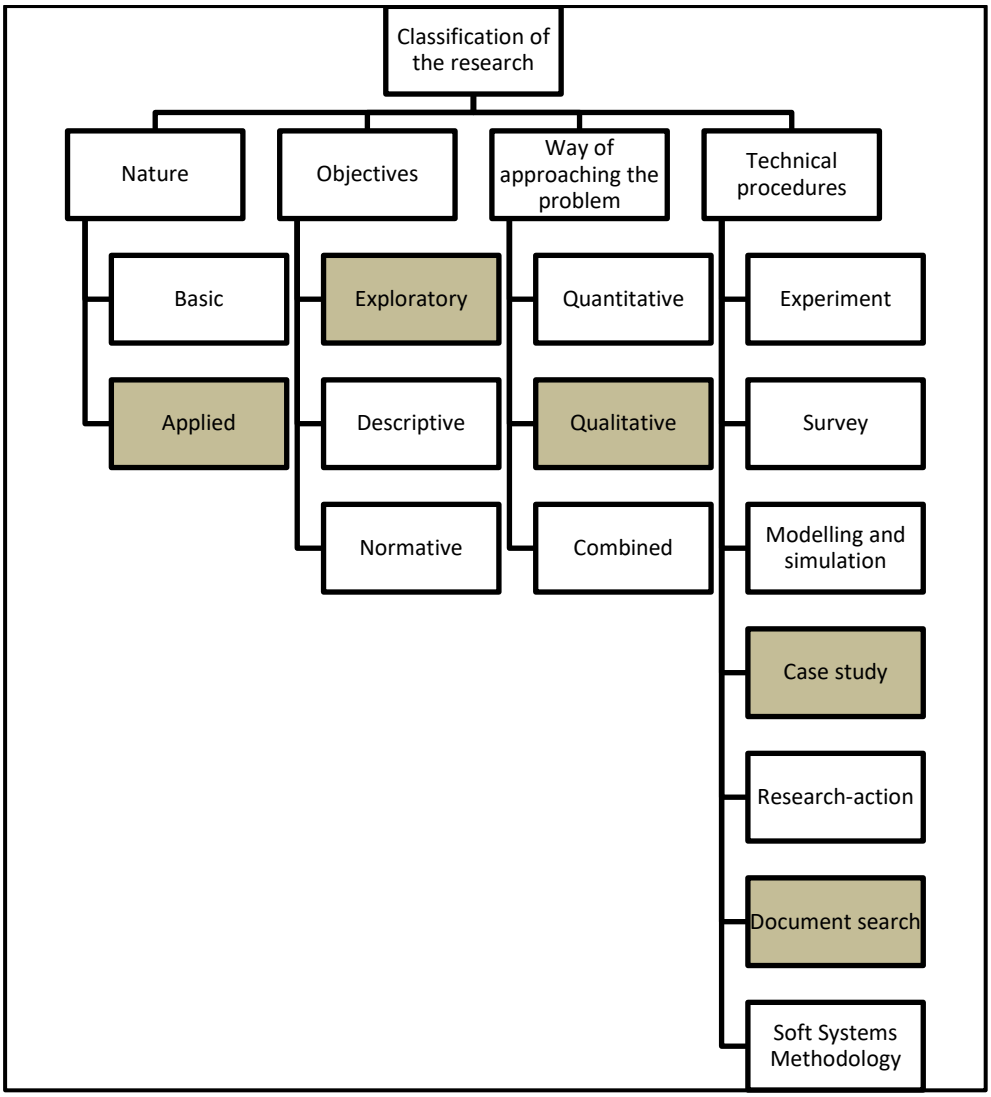
This subsection presents general information about the research method used to develop the study as a whole. However, as this research is structured according to the articles resulting from the main stages of the study, the chapters 2, 3, 4, 5 and 6 have specific subsections that details the methods used for elaborating each article.

1.4.1 Classification of research

Figure 2 shows the classification of this research. As shown in Figure 2, from the point of view of its nature, this research can be classified as applied, since it will generate knowledge for practical and immediate application in real problems of circumstantial interest (KOTHARI; GARG, 2014; PRODANOV et al., 2013). Regarding its objectives, the research can be classified as exploratory, because it will allow to provide greater familiarity with the problem, explaining it through the registration, analysis, classification and interpretation of the phenomena observed; and as descriptive, because it will allow to describe the characteristics of the phenomenon observed (KOTHARI; GARG, 2014; MIGUEL; SOUZA, 2012).

With regard to the approach, the research can be classified as qualitative, which will use the methods of documentary analysis (secondary data analysis) and multiple case studies for its execution. Qualitative research has as main objective to describe and interpret the phenomenon observed through direct and interactive contact of the researcher with the object of study. To this end, it is considered that the subjective reality contributes to the research, therefore, its structure is planned in a way that the researcher understands not only the results, but also how the researcher got to them. To capture this, the qualitative researcher observes the natural environment of the research, which allows the understanding of the organizational dynamics that surround the problem (KOTHARI; GARG, 2014; MIGUEL; SOUZA, 2012).

Figure 2 - Classification of research with emphasis on the types applicable to the study



Source: Elaborated based on Bertrand and Fransoo (2002).

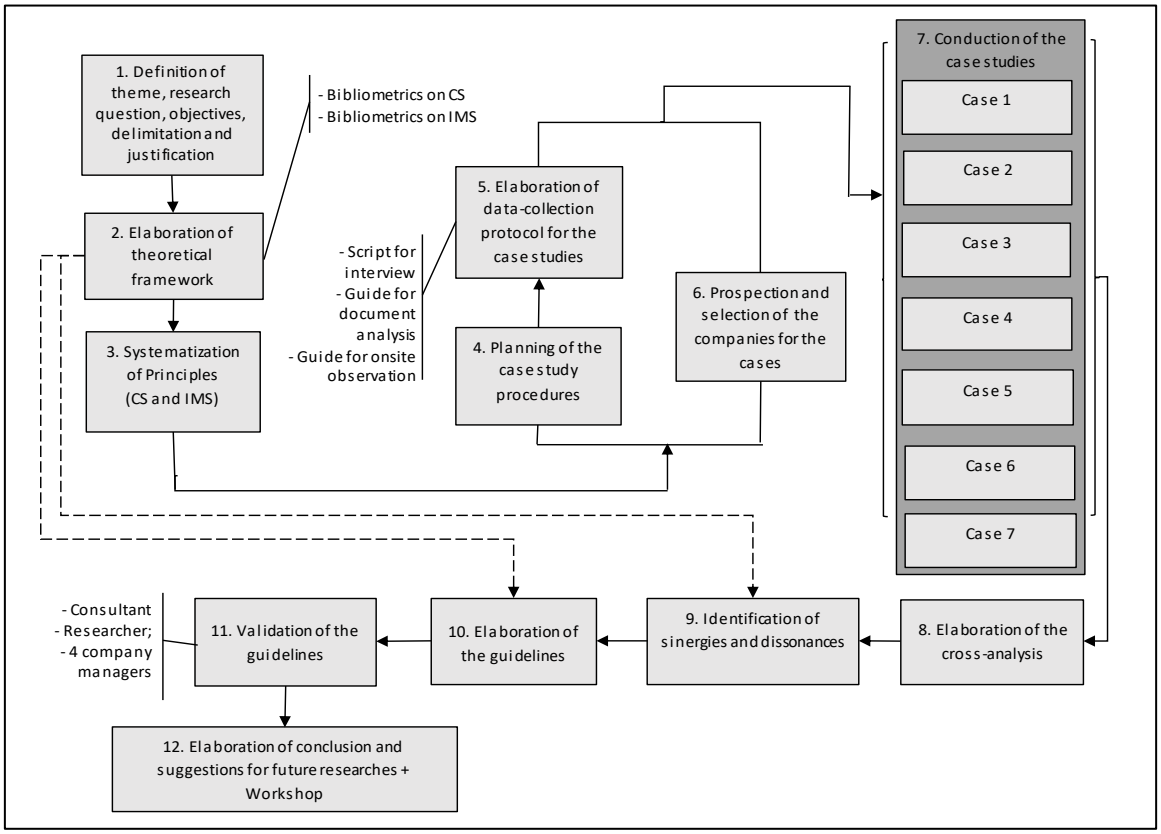
According to Dew (2006), the collection of secondary data through documental research with content analysis presents ease of consultation, information reliability and broad representation (HOFFERTH, 2005). Thus, this research will use the documentary research method, which will involve bibliometric and content analysis performed through the analysis of scientific articles, whose data are not collected by the researchers themselves, but may contribute to the generation of new knowledge (JUPP, 2006).

In addition to the analysis of secondary data, this research will use the method of case studies, which is the detailed study of a phenomenon, in this case an organizational phenomenon, or a reduced number of them. It is the indicated approach to answer questions like "how" and "why" (HYDE, 2000; YIN, 2015).

1.4.2 Methodological flow

This section presents a general methodological flow of the entire research process in order to provide the reader with a general and simplified understanding of how all stages of the work were developed. The methodological flow according to which this research is being developed is shown in Figure 3.

Figure 3 - General flow of the research



Source: Author (2021).

The first step to perform the research was the establishment of the key elements necessary for the elaboration of the project, such as definition of the theme, research question, objectives, delimitation, justification, theoretical framework and research method. These were steps completed during the initial stage of the research project.

The completion of the theoretical framework on CS and IMSs (step 2) comprised the preparation of bibliometrics and on both themes. Bibliometrics is a set of tools for measuring the scientific production of a given area in order to assess the outputs of a period and to identify future research opportunities (OLIVEIRA et al., 2019).

In this research the execution of the bibliometric studies on CS and IMSs aimed at ensuring the consideration of the most relevant authors and articles (more cited in the scientific literature) on both themes in the development of this research. Also, the bibliometrics allowed to justifying the relevance of this work by identifying research gaps in the literature on CS and IMSs.

The search for articles was carried out in Scopus and Web of Science databases and the bibliometric analysis was carried out with the support of Microsoft Excel and VOSviewer. More details about the research method of the bibliometric studies on CS and IMS can be found, respectively, in sections 2.2 and 3.3.

Once the stage of bibliometric studies has ended, the next step was to systematize the principles of CS and IMSs (step 3), which was reached through a systematic content analysis with focus on the content analysis of the 30 most cited articles of Scopus and Web of Science databases from 2008 to 2018 (CS) and from 2006 to 2016 (IMS).

The systematic content analysis consists of a systematic reading and classification of material using the codification to identify themes and patterns (MOLDAVSKA; WELO, 2017). In this step, the principles of CS and IMSs were systematized using the method of inductive content analysis, through which categories are proposed from the material under examination itself (SEURING; GOLD, 2012a). More details about the research method for systematization of pillars of CS and IMS can be found, respectively, in sections 4.3 and 5.3.

The quality of the case studies procedures (step 4) of this thesis was evaluated through the verification that this study ensures compliance with the following aspects highlighted by Yin (2015) as important: a) Use of multiple sources of evidence; Establishment of the chain of evidence; Provide a review of the draft of the case study reports by key informants; Use of replication logic in multiple case studies; Use of case study protocol; and Development of a database for the case studies.

The principles and elements of CS and IMSs supported the structuring of the data collection protocol of the case studies (step 5), which is an important instrument to improve the reliability and validity of the information collected (MIGUEL; SOUZA, 2012). The protocol, together with the results of the secondary data analysis and the case studies, will be used to subsidize the elaboration of the guidelines. The protocol of the case studies contains multiple sources of evidence, highlighting document analysis, on-site observation and interviews, in order to ensure the reliability and validity of the research (MIGUEL; SOUZA, 2012).

For the execution of step 6, it was decided to select companies that have at least 2 certified MSs and that are prominent industrial companies in sustainability in their countries (Brazil,

Portugal and Spain). To identify companies with these characteristics, in addition to the database of the National Institute of Metrology, Standardization and Industrial Quality (INMETRO) for verification of certifications, portals, publications and magazines focused on sustainability were consulted, such as the “Guia EXAME de Sustentabilidade”, “50 Empresas do Bem” from ISTO É DINHEIRO magazine”, “Instituto ETHOS ”, “Lista das empresas mais conscientes” from ISTO É magazine, “Corporate Sustainability Index (ISE)” from BOVESPA, etc. Sources equivalent to these in Portugal and Spain are also being consulted to prospect the companies studied abroad.

The step 7 comprised the conduction of the 7 case studies in Brazil, Portugal and Spain. For Stravos and Westberg (2009), multiple case studies provide researchers a rich set of data for being a simultaneous work involving multiple sources of evidence and a variety of situations, thus making the study more robust.

It has been interviewed those responsible for sustainability and IMS, and, if possible, the responsible for the human resources department and, if applicable, the responsible for other separated MSs. In addition to these, some employees below the top management responsible for these departments will also be interviewed in order to better understand the real situation from different points of view.

The document analysis involved the study of documents directly related to IMSs and sustainability, especially the sustainability report of the studied companies. The on-site observation comprised visits to the "factory floor" and the sectors responsible for IMS, sustainability, human resources, etc.

After performing the individual description and analysis of each case study, a cross-analysis of the results (step 8) will be carried out in order to identify the main good practices and difficulties of developing sustainability and IMS and identify synergies and dissonances between both (step 9). More details about the research method of the study on the synergies and dissonances between CS and IMS can be found in section 5.3.

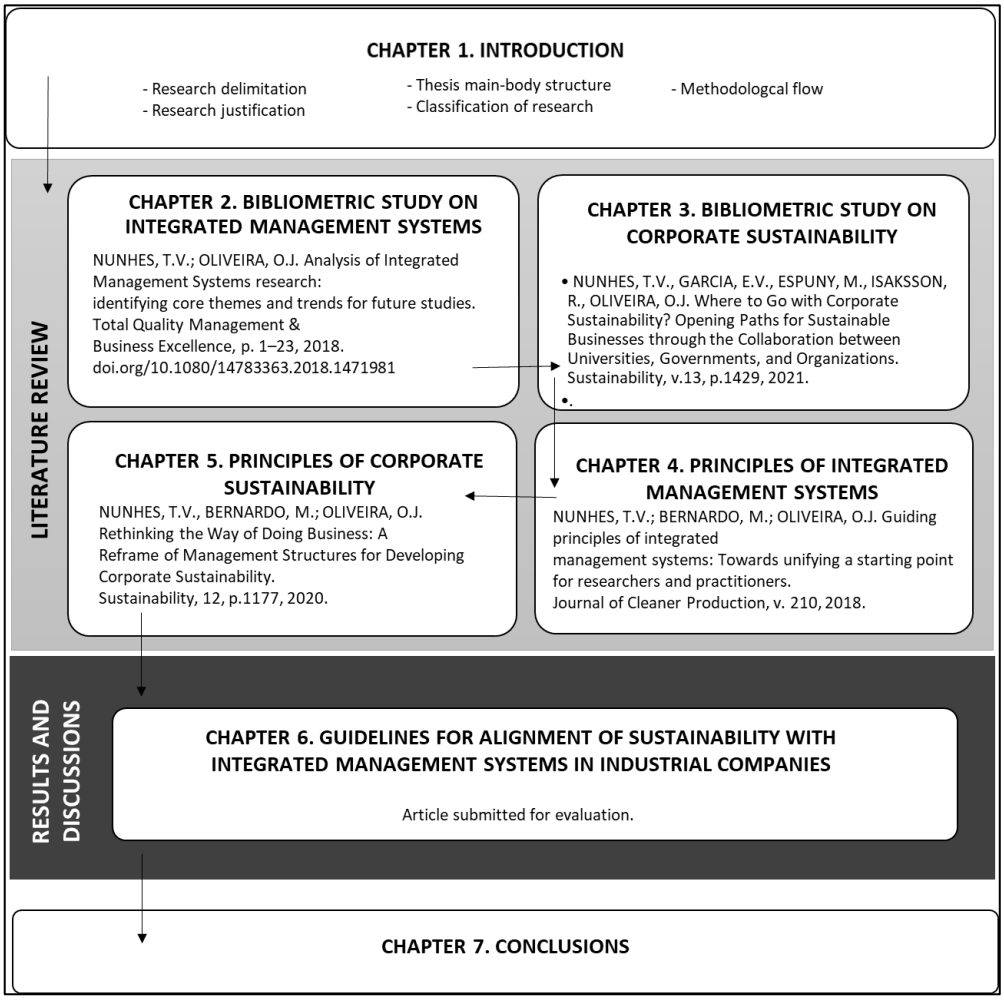
The guidelines for alignment of sustainability with IMS (step 10) were formulated based on the theoretical framework, the principles of CS and IMSs, the 7 case studies and the synergies and dissonances, as shows Figure 3. Following, the proposed guidelines were validated (step 11) by a consultant, a researcher and by some managers of the companies surveyed, who assessed its usability and importance through their previous experiences. Finally, the conclusion and the final text of the research was written (step 12). To disseminate the results of the work presented from chapters 2 to 5, 5 scientific articles were elaborated (4 of them were already published in prestigious international journals such as “Journal of Cleaner

Production", "Sustainability" and "Total Quality Management and Business Excellence" and the last one was recently submitted for evaluation). After the defense of this thesis a free online workshop will also be held with the objective of disseminating the results of the study and encouraging the adoption of societal and business actions toward sustainability by the academic and business community.

1.4.3 Thesis main-body structure

The chapters of this thesis were structured according to the scientific articles that resulted and will result from the main stages of the study. Figure 4 illustrates the thesis main-body structure.

Figure 4 – Thesis main-body structure



Source: Author (2020).

As shown in Figure 4, chapter 1, in addition to introducing the study, presents some important aspects of the work such as research delimitation, justification, main-body structure of the qualification text, research classification, methodological flow and execution schedule.

Chapter 2 presents the first partial results of the research. The development of this thesis required the study of the IMS and CS themes first separately and then jointly. In the stages of isolated studies on the themes, it was decided to start first with the study of IMS and then of CS.

Thus, chapter 2 presents the bibliometric study on IMS and chapter 3 the bibliometric study of SC. The bibliometric studies constitute part of the literature review of this qualification text. They were important in discovering and mapping state-of-the-art on the topics studied and justifying the scientific gaps pointed out in Chapter 1 Introduction.

Following the same logic of starting first with the study of IMS and then of CS, chapters 4 and 5 presents, respectively, the principles of IMS and CS. These two articles are partial results of the thesis that make up the second part of the literature review. Chapters 4 and 5 directly supported the development of the results presented in chapter 6.

Chapter 6 presents the results obtained from the case studies and their comparison with the literature. Specifically, this chapter at the moment presents good practices and difficulties in developing the principles of CS and IMS identified in companies in Brazil, Portugal and Spain. Also, it brings the proposition of the guidelines for the alignment of IMS with the CS, which represents the achievement of the main objective of the work. All previous chapters contributed to the elaboration of chapter 6.

Finally, Chapter 7 presents the conclusions of this thesis and suggestions for future research. The articles that make up this thesis are presented according to the logic of the thesis development, respecting the order of execution of the specific objectives and not necessarily the chronological order of the publications.

2 WHERE TO GO WITH CORPORATE SUSTAINABILITY? OPENING PATHS FOR SUSTAINABLE BUSINESSES THROUGH THE COLLABORATION BETWEEN UNIVERSITIES, GOVERNMENTS, AND ORGANIZATIONS

The article resulting from this step (NUNHES *et al.*, 2021) was published in the "Sustainability" journal and is presented throughout this chapter.

2.1 INTRODUCTION

Population and economic growth have resulted in increasing damage to planet sustainability. As the need for consumption increased, the planet began showing signs that it would not support an unbridled human development. From here onward, alternatives for Sustainable Development (SD) began to be discussed (WHITEMAN; WALKER; PEREGO, 2013). The idea of sustainable development was first presented in the open letter of the World Commission for Environment and Development (p.43), which defines SD as "development that meets present needs without compromising the ability of future generations to meet their own needs" (DEVELOPMENT, 1988). Sustainability initially meant never harvesting more than the forest needs to generate a new harvest in the future (KUHLMAN; FARRINGTON, 2010). The SD concept has evolved and today has different meanings, but most with the same essence of the initial concept, that is, society should not use natural resources at a rate higher than its regeneration (ARAS; CROWTHER, 2008a). This is how the long-term need for human well-being began to be understood (HAHN; FIGGE, 2011).

Initially, the study of sustainability was restricted to areas such as geography and sociology (CURRIE; KNIGHTS; STARKEY, 2010). However, it did not take long for sustainability research was spread and applied in different areas, such as those of the management of public and private power (CULLEN, 2017). In this sense, Currie et al. (2010) argue that the increased interest in the study of sustainability in business may have been a consequence of the various social, environmental and economic crises faced in today's world (CURRIE; KNIGHTS; STARKEY, 2010). Companies are being charged for having negative impacts on SD, as the "price" of extracting, using and disposing of natural resources is quite significant and its effects such as increased air pollution reduced biodiversity and intensification of global warming impact not only the nature but also the survival of society (BAUMGARTNER; EBNER, 2010a). The global community today is consuming the production of more than 1.7 planets per year. The Earth Overshoot day is the date when

humanity’s demand for ecological resources and services each year exceeds what Earth can regenerate. In 2020 the Overshoot Day was August 22 (EARTH OVERSHOOT DAY, 2020). All consumption after this date was taken from resources that should be saved for future generations. Thus, following the scientific vanguard, pressures from various groups, including environmentalists, government and society, have become recurrent in order for companies to make changes to mitigate the negative impacts of their activities on the planet sustainability (BAUMGARTNER; EBNER, 2010a; MILNE; GRAY, 2013b).

As a result of these pressures, the concept of sustainable development began to be applied to the reality of companies, being known as Corporate Sustainability (CS)(ROCA; SEARCY, 2012). According to Lo and Sheu (2007), corporate sustainability is a business strategy in which value is added to the product through risk management in the economic, environmental (or ecological) and social dimensions (LO; SHEU, 2007b). The improvement of companies performance in the three dimensions can be based on the Triple Bottom Line (TBL) (ELKINGTON, 1997). Corporate Social Responsibility (CSR) is often used as a CS synonym, which could be seen as working with SD on the company level. In this paper, we use CS to describe company sustainability embracing all its meanings. CS has gradually shifted from being a mere response to stakeholder pressure to becoming a powerful market differentiator (LEE; FAFF, 2009). The title of being a sustainable company has become increasingly coveted by organizations for a number of reasons, for example the influence that sustainable management can play in defining value-added products and assessing company value in the financial markets (ARTIACH et al., 2010; LEE; FAFF, 2009). In addition, changing the company's view of itself by adopting “green” and innovative practices can result in new, more economically, socially and environmentally efficient products and processes (BOS-BROUWERS, 2009).

According to the United Nations Global Compact (UNGC 2018) the market has also increased its interest in more sustainable companies, as exemplified by the increase of 22% in the US Sustainable and Responsible Investment (ISR) market in the US since 2009. In addition, in 2015 more than 8,000 companies were part of the Global Compact, the world's largest corporate sustainability initiative (UN GLOBAL COMPACT, 2018). Another study published in 2013 by KPMG, a consulting firm that provides auditing and advisory services showed that approximately 233 of the world's 250 most valuable companies are committed to sustainability (DIOUF; BOIRAL, 2017). Consistent with this trend, sustainability reports are increasingly becoming, at a global level, an essential part of CS (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; LOZANO; HUISINGH, 2011). Companies plan, execute and report their data on

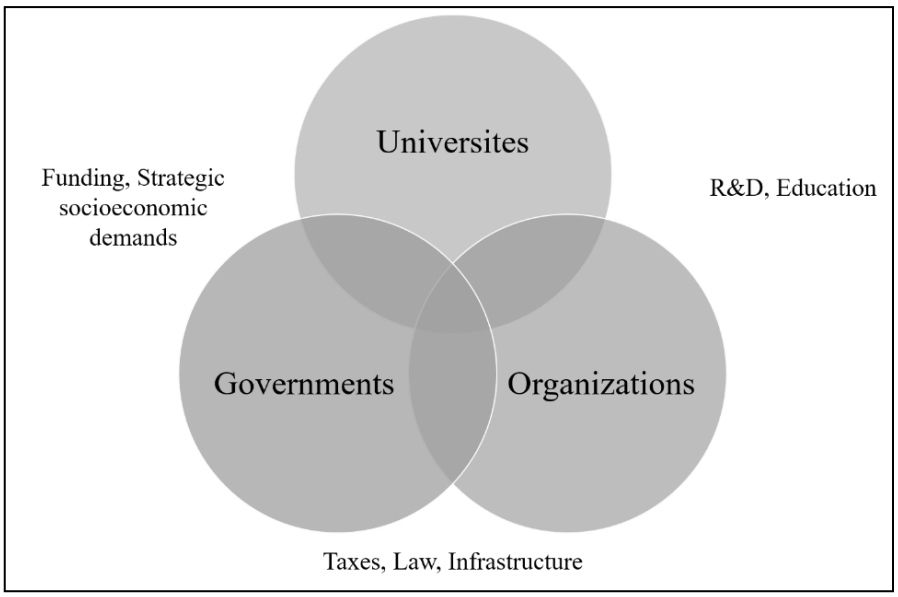
sustainability using sustainability-reporting guidelines. Among them, the guidelines of the GRI standards are the most used for reporting sustainability worldwide (TALBOT; BOIRAL, 2015). They are openly accessible to stakeholders and stimulate competitiveness as organizations are driven to respond to the relevant benchmarks of their competitors (NICOLĂESCU; ALPOPI; ZAHARIA, 2015).

Corporate sustainability indexes, such as the MSCI ESG (Environmental, Social and Governance global index from Morgan Stanley Capital International), DJSI (global Dow Jones Sustainability Index) and ISE B3 (Latin America B3's Corporate Sustainability Index) are another important tool for CS. They are CS assessment tools that, as well as CS reporting tools, provide the users guiding frameworks that support CS implementation. Corporate sustainability indexes facilitate the understanding and evaluation of the companies' performance over time through multidimensional and comprehensive indicators in the areas of Environmental, Social and Governance (ESG) (FEIL; DE QUEVEDO; SCHREIBER, 2017). The most used sustainability index is that of the Dow Jones Sustainability. It is composed of a set of criteria evaluated by the Sustainable Asset Management (SAM) group, to which eligible companies must reflect (ARTIACH et al., 2010; LO; SHEU, 2007b).

As can be seen, there are various fields of study aligned with the aim of developing a sustainable management. The topics related to the economic, social and environmental facets of CS can be studied and applied in an integrated manner (SCHALTEGGER; LÜDEKE-FREUND; HANSEN, 2012), separated (GOYAL; RAHMAN; KAZMI, 2013a) and along with other tools and disciplines (FORMENTINI; TATICCHI, 2016). For example, some to promote CS are the Ecological Footprint, Life Cycle Assessment (LCA), standards such as the ISO 14000 family on environmental management and ISO 26000 on Social Responsibility, Cleaner production techniques to eliminate or minimize waste and emissions at source; Eco-design; Natural Capitalism; the Planetary Boundaries Framework, among others (BROMAN; ROBÈRT, 2017; NAWAZ; KOÇ, 2018). According to Ferreira et al. (2016), when an area achieves significant progress, it is important to map its historical evolution, identifying its structure, strengths and weaknesses (FERREIRA; FERNANDES; RATTEN, 2016). Thus, it is appropriate to investigate the main initiatives, practices and studies in the field of CS that have allowed its development in the last twenty years and that can serve as a basis for universities, governments, and organizations in the implementation of their strategies. In this context, government policies and legislation to foster the adoption of CS practices, research and innovations developed by researchers of the scientific academy in the area and the alignment of business models of companies with the pillars of sustainability have been responsible for

developing CS around the world. The structure of Triple Helix (TH) presented in Figure 5 suggests the interconnection between these sectors to boost sustainable business development (KIMATU, 2016).

Figure 5 - Triple Helix model showing the relations among universities, governments, and organizations



Source: Adapted from Kimatu (2016) and Ranga & Etzkowitz (2013).

Since the recognition of the importance of the theme in the late 1990s, the number of academic, governmental, and business initiatives on CS has been steadily increasing (see Figure 7 in section 2.1). To illustrate this growth during the period covered by this study (1999 - 2018), one can highlight the academic initiatives that resulted in more than 1500 scientific articles published in the Scopus database up 2019 on CS, thus indicating that this is a hot topic of great relevance for the scientific community; the organizations' commitment with more than 1500 patents on the development of sustainable technologies launched; and the government and NGO efforts by using more than 500 documents (reports, cases and white papers) published in the ProQuest and Global Compact platforms.

Further, according to a search in the Scopus database, only in the last five years more than 150 reviews on CS have been published. For instance, Alshehhi et al. (2018) reviewed the literature on the impact of CS on the financial performance of organizations, with the purpose of discussing the key issues that make it difficult to reach consensus on this relationship (ALSHEHHI; NOBANEE; KHARE, 2018). Batista and Francisco (2018) proposed to identify

the sustainable practices carried out by large corporations in an organizational sustainability implementation plan (BATISTA; DE FRANCISCO, 2018). Kourula et al. (2017) focused on the studies of CS in the areas of business and international administration, discussing the potential of interdisciplinary work on this topic (KOURULA; PISANI; KOLK, 2017). Desore and Narula (2017) outlined their research in CS in the textile industry, analyzing the good practices and barriers of this sector in implementing sustainability (DESORE; NARULA, 2018). Naidoo and Gasparatos (2018) developed corporate environmental sustainability strategies that can be inserted in the context of retailers (NAIDOO; GASPARATOS, 2018). Although these reviews have contributed to the state of the art on CS, this review specially adds to the body of knowledge contributions from companies and governments by including the analysis of sustainability reports and patent publications; materials prepared by governments, mainly enactment of laws; and contents of universities and development funds, among other materials that together with the authors' experience formed a basis for the proposition of the framework. The joining of the technical and scientific scenario based on the interpretations and experiences of the authors of this work enriches the results presented and adds to the body of literature a framework adjusted to the development of CS, balanced and consistent with the technical-scientific realities.

Based on the above, the research questions that guided the development of this study can be stated as follows: What is the state of the research on CS considering the last 20 years (1999-2018), what are the main initiatives adopted in the TH spheres and the trends of academic and applied applications on this topic? To answer it, the aim of this paper is to identify and analyze the Scientific-Technical Scenario on CS (STS-CS) and propose a TH-based framework for its development and guidance of future scientific and technological investments. This article identifies maps and updates the ST scenario on CS, which is an important topic in scientific research, given the criticality and urgency of joint responses from different fronts to the various planet's sustainability problems faced around the world. Therefore, the expansion of the possibilities presented in this study will contribute to the promotion of articulation on the role and the importance of the accountability of different society sectors (academia, organizations, and governments - TH model) in favor of the progress towards the transition to a more sustainable society. After this introductory chapter, the method used for the development of the study is presented (section 2.2), followed by the presentation of results and discussions (section 2.3). The framework for corporate sustainability development is presented in section 2.4 and, finally, the conclusions and limitations of the work (section 2.5) close this paper.

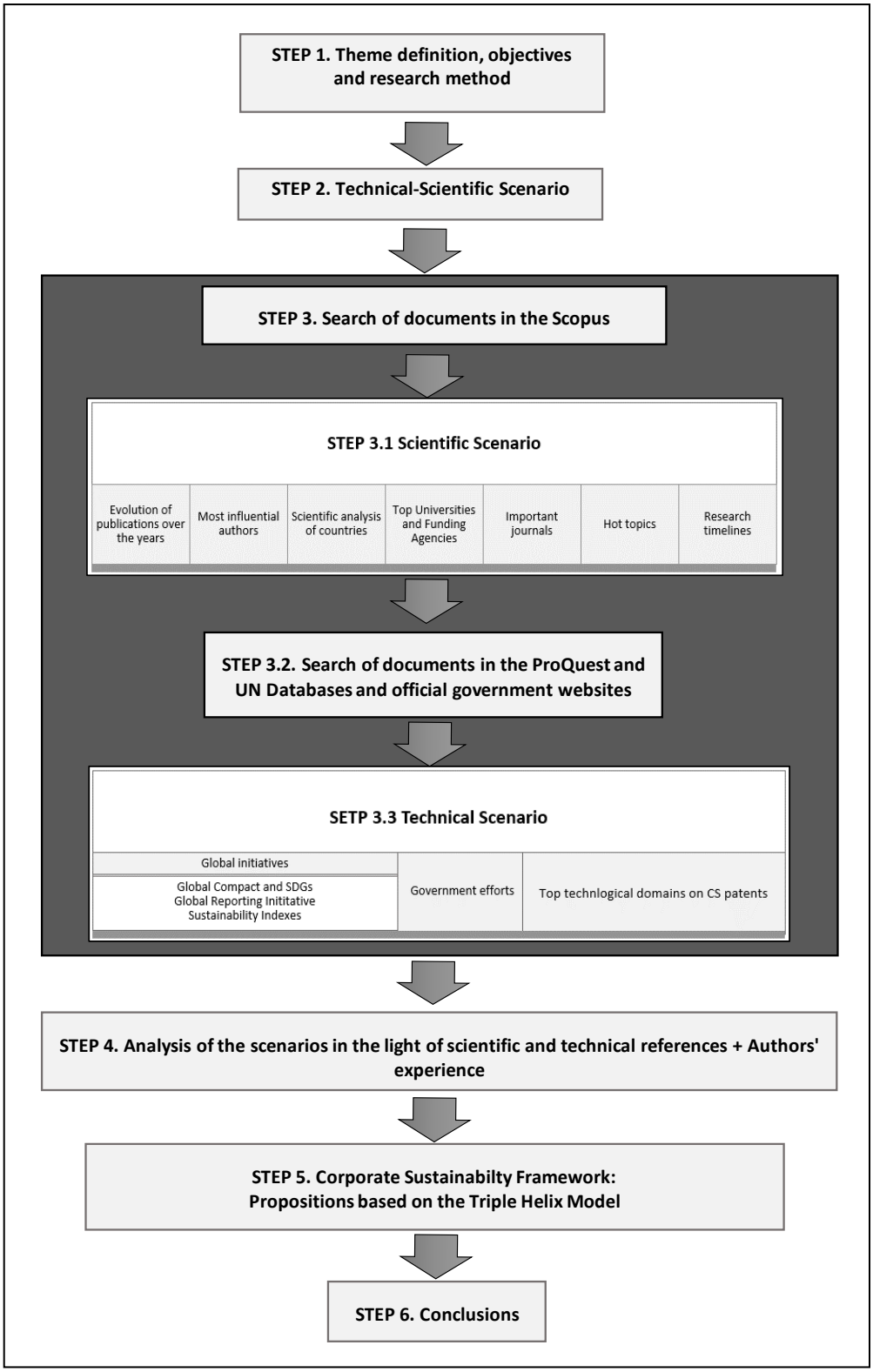
2.2 RESEARCH METHOD

This study was developed using a combined method of bibliometric analysis and content analysis. Bibliometric analysis was used because it allows quantitative measurement of the technical-scientific advances of a subject and identification of the characteristics of its development. This scientific mapping, added to the content analysis of papers, public documents, patents between others, allows the interpretation of the theme and construction of new paths through the systematic identification of themes and development initiatives (CHATHA; BUTT; TARIQ, 2015). The methodological flow according to which this research was conducted is composed of the five main steps as shown in Figure 6.

In the first step shown in Figure 6, the project elements of the study were defined, such as theme, delimitation, objective and research method. These choices were made to identify the scientific importance of developing such a review study. The execution of this work involved, first, the use of the bibliometric analysis method (section 2.3.1) to support the performance of the analysis presented in section 2.3.2 Technical Scenario. The bibliometric method is recommended to measure and evaluate the scientific progress of a given area that had a significant development over the years (JOSÉ, S REIS et al., 2020; NUNHES; OLIVEIRA, 2018). Content analysis complements bibliometric analysis and is used to identify publication trends on the subject based on systematic interpretation of data (CHATHA; BUTT; TARIQ, 2015; NUNHES; OLIVEIRA, 2018).

The second step was the selection of the portfolio of documents. To this end, a search on April 3, 2019 in the Scopus database was conducted to find articles or reviews with the terms “corporate sustainability” or “sustainable management” in the title, abstract or keywords published between 1999 and 2018 (20 years) in English. This period was chosen for analysis because it allows demonstrating all the main stages of evolution of the state of the art on the subject studied, as will be presented later in the analysis of the evolution of publications. Only the Scopus database was used because the vast majority of articles available on the Web of Science database are also available in the Scopus database. In addition, Scopus features many unique articles: of the 50 most cited articles, 12 are only in Scopus. Moreover, articles common between the two databases in all cases have more citations in Scopus than in Web of Science.

Figure 6 - Methodological flow of the research



Source: Nunhes et al. (2021).

With the results, the bibliometric study (step 3.1) began with the ranking of articles based on their respective h-index. This parameter was originally created to evaluate the publications

of a particular author, institution or country in a given area (TIETZE; HOFMANN, 2019), considering in addition to the number of publications of the author, institution or country in the area, the number of citations of each article. For calculating the h-index, it is evaluated whether X articles have at least Y citations each, always seeking the largest common X and Y. The documents resulting from the search were then manually filtered by reading the abstracts and, if necessary, the full text. It is important to manually filter the articles to ensure that the set of articles to be analyzed is in fact consistent with the research boundaries established in the design phase of the study. Thus, at this stage, articles whose main theme was not corporate sustainability were discarded. After these procedures, the data were ranked and quantified using Microsoft Excel.

The articles were then sorted in descending order according to predefined variables such as number of citations, year of publication, research method, journal, country, etc. In step 3.1 an analysis of the evolution of these variables was carried out. This generated bibliometric indicators that allowed to identify and map the state-of-the-art on the topic (SANTOS et al., [s.d.]). The authors, countries, universities, funding agencies, closed-access journals, and open access journals with the highest h-index on the theme were identified and their contributions to CS were discussed. A content analysis of the portfolio of articles was also carried out. The texts were read by all the authors of the work, who identified key issues for their interpretation, among them objective, results and suggestions for future research. The notes taken were compared and discussed in weekly meetings to prepare the analysis of the evolution of the timeline and hot topics.

The results obtained in step 3.1 were used as a starting point to explore the technical scenario. In step 3.2, a study on the patents related to CS and registered in the last 20 years was conducted. The Orbit Intelligence database platform was chosen for performing this analysis, as it gathers the patents of more than 100 patent offices around the world and, therefore, allows a wide analysis on the level of development of sustainable technologies. Similarly, the ProQuest and UN Global Compact platforms were used to identify documents that addressed the CS initiatives proposed by public entities. The search criteria for selecting patents and documents in these databases are detailed in Table 2.

Table 2 - Search criteria

SEARCH CRITERIA	PARAMETERS
Databases	Orbit Intelligence, ProQuest, UN Global Compact
Time Period	2000 - 2020
Research Fields	Title and Invention Objective
Keywords	"sustainability", "environmental pollution", "environmental sustainability", "sustainable development", "economic sustainability", "social sustainability", "eco efficiency", "cleaner production", "corporate sustainability" OR "life cycle assessment", "industrial ecology", "circular economy"

Source: Nunhes *et al.* (2021).

In the technical scenario (step 3.3), the most relevant contributions from governments, and organizations were identified from the perspective of the Triple Helix model presented in the introduction of this study. International organizations' initiatives such as World Economic Forum's Davos manifest, Global Compact, Agenda 2030 and DJSI; government technical efforts for CS development of the three countries with most companies listed in DJSI; and the main countries and companies that most registered patents on the theme were identified and their actions developed towards CS were discussed. For this, a documental analysis of materials published by governments and international public and private organizations, such diverse reports, white papers, laws and regulations and web pages was conducted. In step 4, all initiatives, strategies and policies mapped in the STS-CS were analyzed in light of the literature and experience of the authors of the study. The scopes of the initiatives were expanded and adapted to the domains of the Triple Helix sectors through a process of enriching the good practices identified in the CS scenarios (step 5). As a result, a framework was proposed with actions for fostering sustainable development in the public, private and academic spheres based on a wide range of technical and scientific information structured on the TH model. Finally, in step 6 the conclusions and suggestions for future studies were elaborated.

2.3 SCIENTIFIC-TECHNICAL SCENARIO

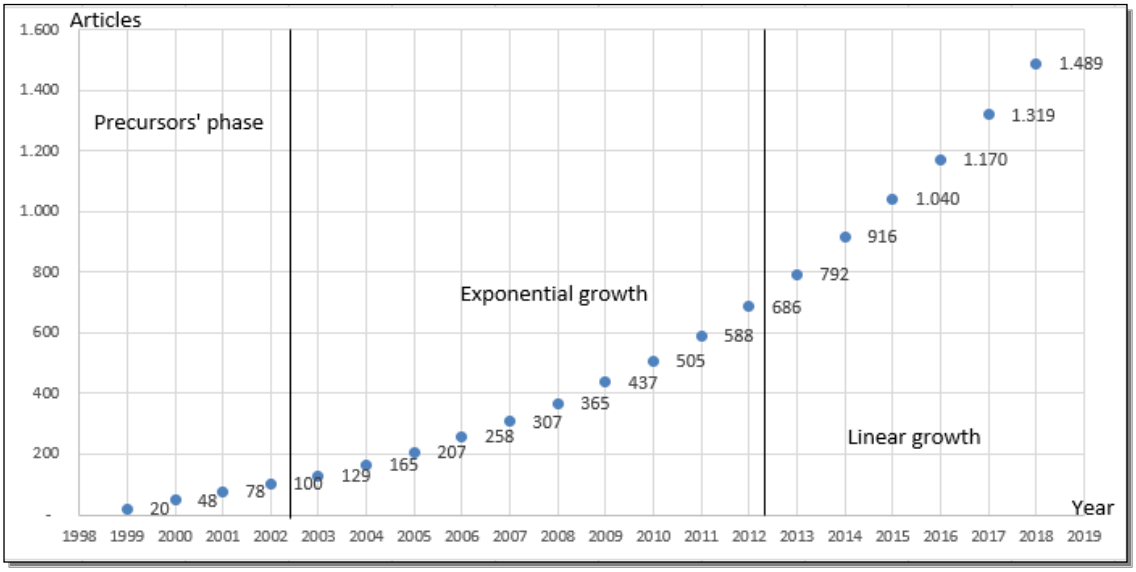
This topic will address outstanding scientific and applied initiatives in the CS area. The main academic, governmental and business initiatives on this topic were mapped, which are references of good practices in the area and served as a basis for proposing the framework for development of CS, presented in section 2.4.

2.3.1 Scientific scenario

2.3.1.1 Maturity level of scientific development

The theme of Corporate Sustainability (CS) started to be scientifically explored in the 90s. Figure 7 shows the evolution of publications on this theme over the years with the x-axis showing the numbers of articles accumulated annually. According to Price's law, the scientific output of a given field grows exponentially and this growth can be broken down into four phases, as shown in Figure 7 (CRISTINO; NETO; COSTA, 2018).

Figure 7 - Evolution of CS publications over the years



Source: Scopus (2019).

The Price's law suggests that the pattern of scientific development follows an exponential growth and its epistemological domain goes through four phases (DABI et al., 2016). Figure 7 shows the differences between three of these four phases. The first phase, which began in 1999 until 2002, is the period characterized by the precursor's studies of this field of knowledge with a small number of publications (DABI et al., 2016). In the second phase (2003–2012), the

expansion of the scientific field tends to attract a significant number of researchers. In this period, the number of publications reaches approximately 40% of the total of articles published. In the third phase (2013–2018), this field of knowledge is expanding, and the volume of publications grows linearly until the end of the last year of analysis (2018). Thus, there is no indication that this scientific field is close to achieve full maturity, as it is not possible to see any turning point (CRISTINO; NETO; COSTA, 2018).

2.3.1.2 Major authors

Table 3 presents some general information on the major authors on the topic, such as name, h-index on the topic corporate sustainability, number of publications and number of citations accumulated in the period analyzed and the average of citations per article. In addition, in the last two columns, the evolution of the publications and annual citations of the authors is also presented.

Table 3 - Top three authors

Author	H-index	Average citations by publication	Number of publications (1998-2018)	Citations (1998-2018)	Annual Publications (1999-2018)	Annual Citations (1999-2018)
Schaltegger, S. (Germany)	15	38,7	26	1006		
Searcy, C. (Canada)	14	51,8	20	1035		
Baumgartner, R. J. (Áustria)	10	46,5	11	512		

Source: Scopus (2019).

Most of the authors identified as the most influential presented have an increase in the number of citations over the 20 years (Table 3). These data with Figure 7 (evolution of sustainability publications over the years) show how CS is becoming an increasingly hot topic in academia. Stefan Schaltegger is a professor at Leuphana Universität Lüneburg Center for Sustainability Management in Luneburg (Denmark) and founder of the first MBA in Sustainability Management in the world in 2003. His main research areas are corporate sustainability management, environmental and sustainability accounting, business cases for sustainability and sustainable entrepreneurship (EMAN, 2020; LEUPHANA, 2020).

Professor Dr. Cory Searcy works at the College of Engineering and Architectural Science. His research areas are carbon footprint, corporate social responsibility, environmental management systems, sustainability indicators and reports and sustainable supply chain management. He is project manager of a study on the use of sustainability indicators in corporate decision-making at the International Institute for Sustainable Development in Winnipeg, Manitoba (RYERSON UNIVERSITY, 2020a, 2020b). Professor Rupert J. Baumgartner is affiliated to the University of Graz and works at the Institute of Institute of Systems Sciences, Innovation and Sustainability Research where conduct research on Corporate Social Responsibility, Sustainable Strategic Management, Life Cycle Assessment and Industrial Ecology. He also works in circular economy projects funded by the European Union and is a member of the international sustainable development research society (GRAZ UNIVERSITY, 2020). The authors García-Sánchez and Martínez-Ferrero published a significant number of articles in the most recent period of Corporate Sustainability.

In relation to the countries, Table 4 shows that the top three authors are from developed countries. This is probably explained by the fact that sustainability issues often start in well-established public and private organizations, which many times adopt sustainability measures under governmental and popular demands (HAHN et al., 2015; LEE; FARZIPOOR SAEN; FARZIPOOR, 2012).

Moreover, as these companies operate in most developed countries, there is a trend of scientific research to accompany this demand. Also, it is interesting to note that in most developed countries there has been a high investment on behalf of the government in CS research (ATKINSON, 2000).

2.3.1.3 Scientific Government Efforts

Table 4 presents the major countries that stand out on the scientific scenario of corporate sustainability, ranked by their h-index and their number of publications and number of citations accumulated in the period analyzed.

Table 4 - Top three countries

Countries	H-index	Average citations by publication	Number of publications (1998-2018)	Citations (1998-2018)	Annual Publications (1999-2018)	Annual Citations (1999-2018)
United States	37	19,8	238	4708		
United Kingdom	34	24,6	159	3909		
Germany	33	30,1	109	3284		

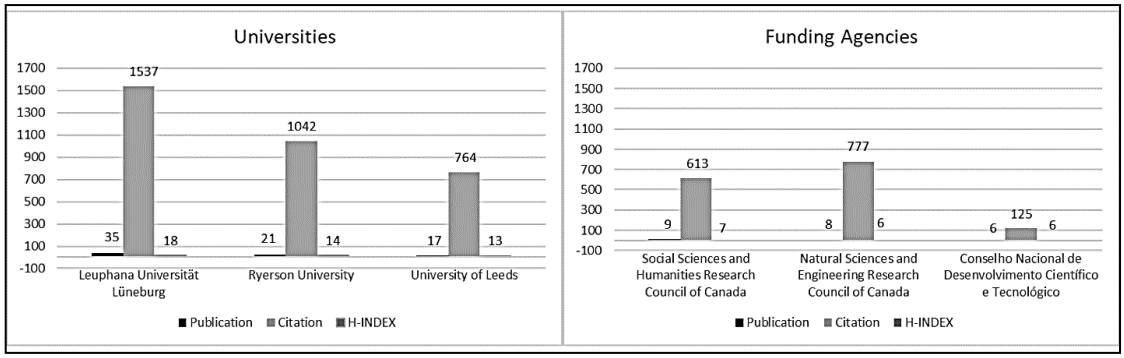
Source: Scopus (2019).

The three countries that have companies participating in the DSJI (Table 4) are the ones that publish the most in Corporate Sustainability. The United States and the United Kingdom are among the most prominent countries, both in the number of scientific publications and in the number of sustainable companies (Table 4). The European predominance in the two analyses is mentioned, with, respectively, two and five countries. Comparing the total of US publications with the total of sustainable companies operating in its territory, we observe that total participation of the United States is approximately 50% and 25%, respectively. This comparison demonstrates the strength that this country has in the theme, being highlighted in both the academy and market.

Figure 8 presents an analysis of the major universities and funding agencies. For both analyses, the h-index, the evolution of publications, evolution of citations and the average number of citations are shown. China, India, and Spain have published many articles in recent years. According to the data on the evolution of publications, these three countries will probably stand out in Corporate Sustainability in the coming years.

The top three universities and funds were ranked in descending order, according to the higher H-index in Figure 8.

Figure 8 - Top three Universities and Funding Agencies



Source: Scopus (2019).

First, in the ranking of universities, Leuphana University, has graduate and extension courses focused on sustainability (LEUPHANA UNIVERSITY OF LÜNEBURG, 2020a). At the undergraduate level, the “Global Environmental and Sustainability Studies” course is offered in English with professors and students from different countries. In the Master's Program, the following courses are offered: “Global Sustainability Science”; “Sustainable Management, Accounting and Finance”; “Sustainability Law” and “Sustainable Management” and “Sustainability Science,” with the last course also offered at the doctorate level. Among the lines of research focused on sustainability are “sustainable chemistry”; “management and economics of sustainability”; “socio-ecological systems”; “individual and collective learning and behavior”; and “transdisciplinary research on sustainability, methods and ethics” (LEUPHANA UNIVERSITY OF LÜNEBURG, 2020b).

In the second place in the ranking of universities, Ryerson University offers the professional master's program in Energy and Innovation and maintains an Urban Energy Center (CUE), which acts as an incubator focused on developing innovations for electric vehicles, renewable energy, energy distribution and solutions for sustainability in companies. The UEC has generated more than 100 jobs, raised more than USD 8.3 million in resources for the incubated companies and currently has 15 active startups (RYERSON UNIVERSITY, 2020c). Ryerson University offers extension courses in sustainability management and business process excellence (RYERSON UNIVERSITY, 2020a). The program of studies in Corporate Social Responsibility has initiatives to strengthen the relationship with the private sector, government, society, among other stakeholders to encourage the dissemination of Social Responsibility guidelines. The institution also promotes collaborative learning and the development of undergraduates and postgraduates on CSR (RYERSON UNIVERSITY, 2020d).

The third university in the ranking of the main universities is the University of Leeds, one of the most recognized in the world in relation to the implementation of the Sustainable Development Goals (SDGs) proposed in the 2030 Agenda for Sustainable Development (TIMES HIGHER EDUCATION IMPACT RANKINGS, 2020). The university supports more than 70 projects through the Global Challenges Research Fund and the Newton Fund (UNIVERSITY OF LEEDS, 2020a). The University of Leeds maintains a portal exclusively dedicated to sustainability with guidelines for students, employees and the community for involving each of these parties in subjects such as “Incorporating sustainability through collaboration”; "Making the most of resources"; “Building knowledge and capacity”; and “Being a positive partner in society” (UNIVERSITY OF LEEDS, 2020b).

The University of Leeds publishes an annual sustainability report that transparently shows its performance obtained on economic, social and environmental activities and contributions to the SDGs. In its latest published report (2017–2018), it was highlighted the partnership with City Councils, public and private organizations to the fight against global warming issues (UNIVERSITY OF LEEDS, 2018).

Regarding funding, also shown in Figure 4, the Social Sciences and Humanities Research Council of Canada rank first, providing more than $100,000 in funding for the project "Consumer Perceptions of Brand Social Responsibility: How Brand Level Factors and CSR Shape Consumer Responses to Brands" developed between 2015 and 2019 (CANADA, 2015). Second, the Natural Sciences and Engineering Research Council of Canada received investments of more than USD 30,000 for developing the project "New Issues in Supply Chain Management: Sustainability, Corporate Social Responsibility and Cognitive Bias" (CANADA, 2018).

The third main fund is the Brazilian National Council for Scientific and Technological Development (CNPq), which in 2018 invested USD 35 million in projects, one of the areas contemplated being "Research and Development in Urban and Regional Sustainability" (BRASIL, 2020). CNPq also maintains the National Environmental Education Program, which seeks to promote environmental education, peace, social justice and economic growth (BRASIL, 2018).

2.3.1.4 Major scientific journals

The evaluation of the most important journals in the area is interesting to guide new researchers on what are the main sources of knowledge and where they can submit their future

work (Oliveira et al., 2019). Table 5 lists the impact factor of each journal in the top ten. According to Pinto and Andrade (1999), the impact factor is a way of measuring how articles published in a given journal impact the scientific community (PINTO; ANDRADE, 1999). This measure is made periodically considering the number of publications and citations received for a given period. The top three non-open access journals and the top three open-access were ranked according to the highest h-index. Table 5 presents the published articles number and the citations number of these major journals on CS theme.

Table 5 - Top journals

Journals/JCR	Open Access	H-index	Average citations by publication	Number of publications (1998-2018)	Citations (1998-2018)	Annual Publications (1999-2018)	Annual Citations (1999-2018)
Journal of Cleaner Production / 7,246	No	49	44,6	157	7009		
Business Strategy And The Environment / 5,483	No	34	71,1	72	5118		
Journal of Business Ethics / 2,917	No	34	57,3	71	4113		
Plos One / 2.740	Yes	21	39,1	65	2539		
Sustainability Swizerland / 2.576	Yes	19	10,9	157	1704		
Ecology and Society / 3.890	Yes	19	28,3	32	905		

Source: Scopus (2020).

The close access journal with the highest h-index, number of publications, and citations is the Journal of Cleaner Production. This traditional and respected journal is interdisciplinary, accepts research with theoretical and practical contributions and focuses on environment, cleaner production, sustainable development, and sustainability, among other topics. The Business Strategy and the Environment journal feature the second largest h-index, number of publications, and citations. Its scope encompasses studies on the relationship between business and the environment, especially contributions to understanding how companies can increase their “environmental performance.” The Journal of Business Ethics journal is the third with largest h-index from the close access journals. It aims to be a forum for discussion and debate about ethical questions related to business, such as corporate social responsibility issues.

Plos One is the open access journal with the highest h-index on the theme (21). It is a multidisciplinary journal focused on facilitating access to 200 areas such as engineering, medicine, and social sciences. The second journal with the highest h-index on the theme (19) is Sustainability, that is focused on publishing research on environmental, cultural, economic, and social sustainability. This is the most important journal specialized in the dissemination of advances in CS. Finally, the Ecology and Society journal is focused on studies on management, stewardship and sustainable use of ecological systems, resources and biological diversity. Studies that explore the relationship between society actions, policies and ecological systems can also fit in the scope of this journal. Corporate Social Responsibility and Environmental Management and Social Responsibility Magazine are scientific journals that should also be considered as a source of outstanding information on Corporate Sustainability.

2.3.1.5 Hot Topics and Timeline overview

The main keywords of the portfolio of articles selected for the bibliometric analysis are categorized into ten groups that explain the characteristics of each respective themes (PHILLIPS; SHEFF; BOYER, 2015). This grouping technique aims by joining words with the same nature to allow the understanding of the hot topics of each distinct group (COBO et al., 2012).

In the set of articles analyzed, 3,464 keywords were found that were classified to prevent the same keyword from being classified into two groups simultaneously. In all, 3,314 keywords were excluded from the analysis because they refer to regions, methods or because they are expressions that did not contribute to the field of study.

With this filter applied, 150 keywords cited in 1,489 documents were grouped into ten hot topics. Table 6 shows the participation of the hot topics in the analyzed articles.

Table 6 - Hot topicss

Research theme	Keywords
Business Characterization	Automotive-industry, Business,business-case, Business-model, Construction-industry, Entrepreneurship, Family-business, Materiality, Small-and-medium-sized-enterprises, Small-to-medium-sized-enterprises, SMEs, Sustainable-business, Sustainable-entrepreneurship
TBL- Environmental	Carbon-footprint, Cleaner-production, Climate-change, Corporate-environmental-performance, Eco-efficiency, Ecology, Ecosystems, Efficiency, Energy, Environment, Environmental, Environmental-management, Environmental-management-systems, Environmental-reporting, Environmental-sustainability, ISO 14001, Sustainable-consumption
TBL- Social	Corporate-social-performance, Corporate-social-responsibility-(CSR), Dynamic-capabilities, Education, ISO 26000, Organizational-change, Social, Socially-responsible-investment, Social-responsibility, Stakeholder-engagement, Sustainable-leadership
TBL- Finance	Accountability, Corporate-financial-performance, Economic, Economic-growth, Economic-sustainability, Environmental-management-accounting, Investment, Socially-responsible-investment, Sustainability-accounting, Value-creation
Governance	Business-ethics, Communication, Corporate-governance, Corporate-responsibility, Decision-making, Disclosure, Ethics, Governance, Leadership, Legitimacy, Organizational-culture, Reputation, Responsibility, Stakeholder, Stakeholders, Standards
CS Strategy	Benchmarking, Business-strategy, Competitive-advantage, Competitiveness, Corporate-reputation, Corporate-strategy, Environmental-strategy, Stakeholder-analysis, Stakeholder-theory, Strategic-management, Strategic-planning, Strategy, Sustainability-strategy, Sustainable-business-models, Sustainable-competitive-advantage, Sustainable-development-goals, Trade-offs

Source: Author based on Scopus (2020).

To assess the growth of studies in the field of Corporate Sustainability (Table 7), the percentage values of the ten themes from 2014-2018 (D) were used, decreasing from the values obtained for the period 2004-2008 (B). The difference between the two periods mentioned, demonstrates the growth that each of the themes has achieved over the past few years. To calculate the variation of percentage points between the periods, the last period (D) was subtracted by the second period (B), considering that the first period (A) obtained a number of very incipient number of publications.

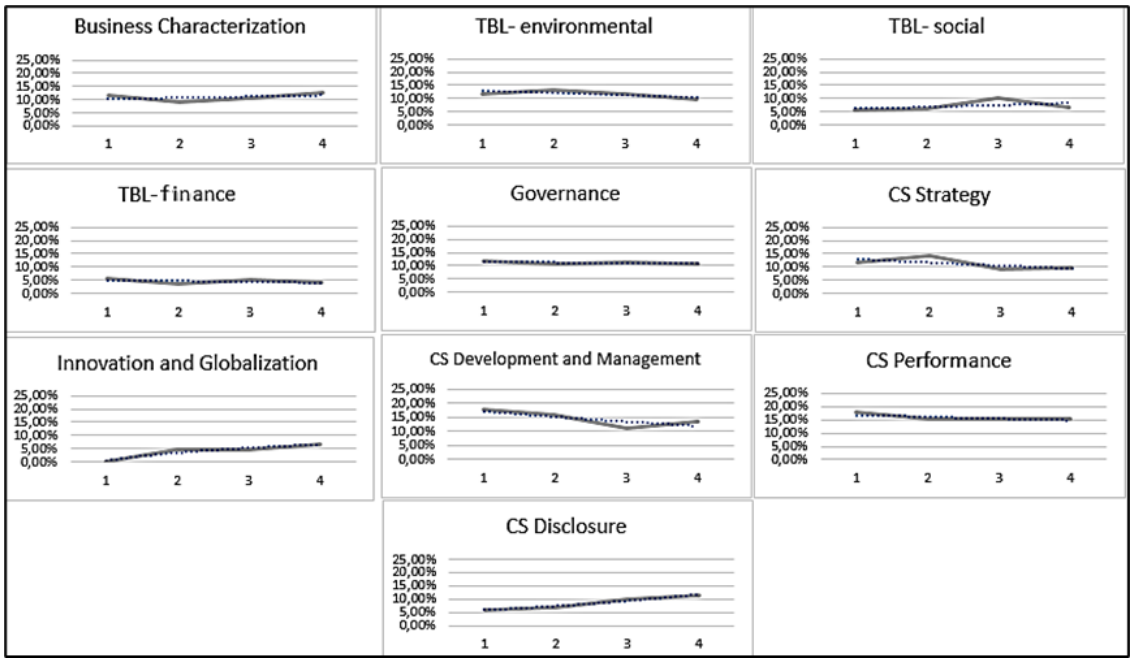
Table 7 - Participation of the hot topics in the analyzed articles

Research theme	1999 – 2003 (A)	%	2004 – 2008 (B)	%	2009 – 2013 (C)	%	2014 – 2018 (D)	%	D – B (E)
Business Characterization	87	11,76%	169	8,93%	441	10,89%	798	12,66%	3,73%
TBL- environmental	87	11,76%	253	13,39%	481	11,88%	600	9,52%	-3,87%
TBL- social	44	5,88%	118	6,25%	421	10,40%	435	6,90%	0,65%
TBL- finance	44	5,88%	68	3,57%	201	4,95%	257	4,08%	0,51%
Governance	87	11,76%	203	10,71%	462	11,39%	673	10,67%	-0,04%
CS Strategy	87	11,76%	270	14,29%	381	9,41%	600	9,52%	-4,77%
Innovation and Globalization	0	0,00%	84	4,46%	190	4,70%	415	6,59%	2,13%
CS Development and Management	131	17,65%	304	16,07%	451	11,14%	844	13,39%	-2,68%
CS Performance	131	17,65%	287	15,18%	612	15,10%	963	15,27%	0,09%
CS Disclosure	44	5,88%	135	7,14%	411	10,15%	719	11,40%	4,26%
TOTAL	741	100,00%	1891	100,00%	4052	100,00%	6304	100,00%	

Source: Nunhes *et al.* (2021).

In Figure 9 it is possible to observe the fields that present indexes with greater growth potential (such as CS Disclosure and Business Characterization), stability (such as CS Performance and Governance) and decrease (such as CS- Strategy and TBL- environmental). Figure 9 shows the relevance of the identified hot topics on CS over the years. The themes "disclosure" and "innovation and globalization" presented growth over the periods analyzed. The other hot topics presented practically constant scientific relevance over the years. The analysis of gaps and suggestions for future research identified gaps and research suggestions in the thirty most cited articles published in the last five years (2014–2018).

Figure 9 - Evolution of the participation of the research subgroups



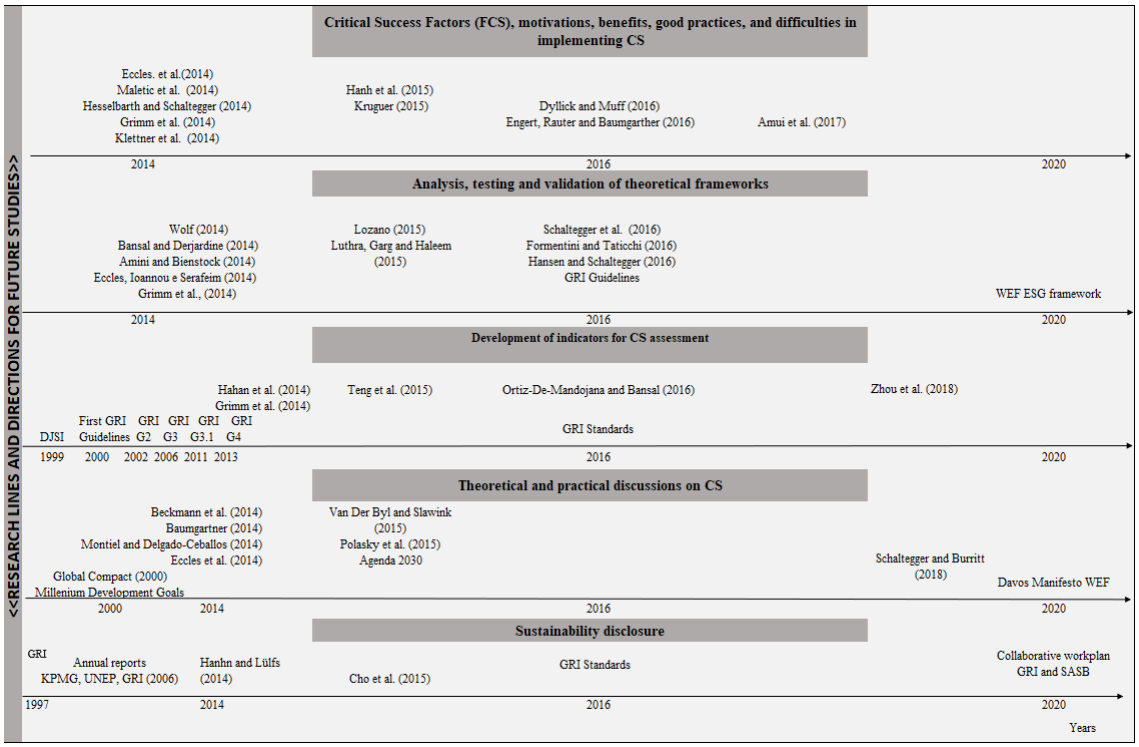
Source: Nunhes *et al.* (2021).

More recent articles were selected to reflect where the state of the art on the subject is going. Except for the period of publication, all other search criteria for articles on search databases (language, type of publication, etc.) were maintained as described in the method section of this paper. The identification of the research lines was supported by the content analysis of the articles, which consisted of a systematic reading of sections considered key for identifying gaps and future research suggestions (DE OLIVEIRA et al., 2019).

Gaps and explicit suggestions of research were identified in the conclusion section of the articles, while implicit gaps and suggestions were identified in the theoretical framework and the section of discussion and results. Once the implicit and explicit gaps and suggestions were identified, they were grouped into five main areas with potential for further studies. These areas are shown in Figure 10.

As Figure 10 shows, the gaps identified in the thirty articles were grouped into five areas: Critical Success Factors (CSF), motivations, benefits, good practices, and difficulties in implementing CS; analysis, testing and validation of theoretical frameworks; development of indicators of CS assessment; theoretical discussions on the CS theory and studies to improve CS report.

Figure 10 - Timeline overview



Source: Nunhes *et al.* (2021).

Note that some important milestones for CS that were or will still be mentioned throughout this article were also added to the timelines as aspects to be considered in the development of future research, such as the DJSI, GRI, Agenda 2030, among others.

During the 2014–2018 period, several studies pointed to the need to investigate the CSF, motivations, benefits, good practices, and difficulties of developing CS. However, it was observed that this line changed direction between 2014 and 2018 due to the progress made with the development of studies on the subject. In 2014, the studies more generally pointed to the need to understand what led managers to implement CS and the specific conditions that could lead to the success or barriers of implementation (ECCLES; IOANNOU; SERAFEIM, 2014; GRIMM; HOFSTETTER; SARKIS, 2014). Therefore, the development on the subject led Engert et al. (2016) to highlight more specifically that the focus of research should be on identifying internal drivers of sustainability (ENGERT; RAUTER; BAUMGARTNER, 2016). More recent studies have suggested that the need now is to answer how to address the difficulties and challenges of implementing sustainability identified in recent years (AMUI et al., 2017; ENGERT; RAUTER; BAUMGARTNER, 2016). To this end, it is recommended to develop, for example, communication tools and frameworks for sustainability development and management (ENGERT; RAUTER; BAUMGARTNER, 2016) and to identify dynamic

capabilities, knowledge and skills that can help address difficulties and challenges of implementation (AMUI et al., 2017).

Another group of authors suggests that future studies could develop analysis, testing and validation of theoretical frameworks found in literature. Many authors propose frameworks for implementing, measuring and evaluating corporate sustainability, but they do not empirically test them, or only test them under specific conditions. Lozano (2015), for example, suggests that the framework proposed by him be tested in companies with different hierarchical levels, geographical location and different external stakeholders (LOZANO, 2015). Wolf (2014), suggests testing if the relationships between stakeholder pressure, sustainable supply chain and corporate sustainability performance proposed in his research are maintained when the economic performance variable is added (WOLF, 2014). This line of research does not tend to be saturated as constantly new frameworks are proposed and require validation in different scenarios. Thus, it is suggested that future studies seek to review the various frameworks presented in the literature, in order to validate them in different environments and identify opportunities for improvement (ECCLES; IOANNOU; SERAFEIM, 2014; FORMENTINI; TATICCHI, 2016; GRIMM; HOFSTETTER; SARKIS, 2014).

The third group of gaps and suggestions addresses the development of indicators to assessment of CS. The development of this line of research is an offshoot of the research line on “CSF, motivations, benefits, good practices and difficulties in CS” as many sustainability indicators and metrics are created to control and manage critical success factors. Ortiz-de-Mandojana and Bansal (2016), for example, recommend the creation of socioeconomic indicators that are able to capture the degree or intensity of development of sustainability practices (ORTIZ-DE-MANDOJANA; BANSAL, 2016). Zhou et al. (2018) suggest that indicators be created for monitoring and managing social sustainability, since indicators of economic and environmental sustainability have been widely discussed in the literature (ZHOU et al., 2018). The other line of research gathers suggestions for a more homogeneous development of the corporate sustainability theory. Although the concept of corporate sustainability has already been widespread, some authors argue that the definitions of corporate sustainability need to be more homogeneous among researchers and professionals from different fields (ECCLES; IOANNOU; SERAFEIM, 2014; MONTIEL; DELGADO-CEBALLOS, 2014b). In this sense, many studies on corporate sustainability have missed the opportunity to achieve more synergistic and comparable results because they consider different conceptual bases (ECCLES; IOANNOU; SERAFEIM, 2014; MONTIEL; DELGADO-

CEBALLOS, 2014b). Thus, a greater unification in the understanding of what is CS could support the state-of-the-art advancement on the subject (VAN DER BYL; SLAWINSKI, 2015).

Finally, there is a line of research related to the study of corporate sustainability reports. R. Hahn and Lülfs (2014) suggest that it is necessary to investigate readers' perceptions regarding the manipulation of information in CS reports and assess the risks inherent to business legitimacy (HAHN; LÜLFS, 2014). Specifically, the authors state the need to study the risks arising from neglect to report CS difficulties and negative aspects. According to Cho et al. (2015), it is necessary to study ways for the reports also present the difficulties faced by each company in relation to sustainability, thus promoting transparency to stakeholders (CHO et al., 2015).

2.3.2 Technical scenario

This section presents the analysis that makes up the technical scenario of CS. Several technical publications on the subject were analyzed in order to identify CS initiatives developed in the TH sectors by non-governmental and private organizations, governments and universities.

2.3.2.1 World Economic Forum

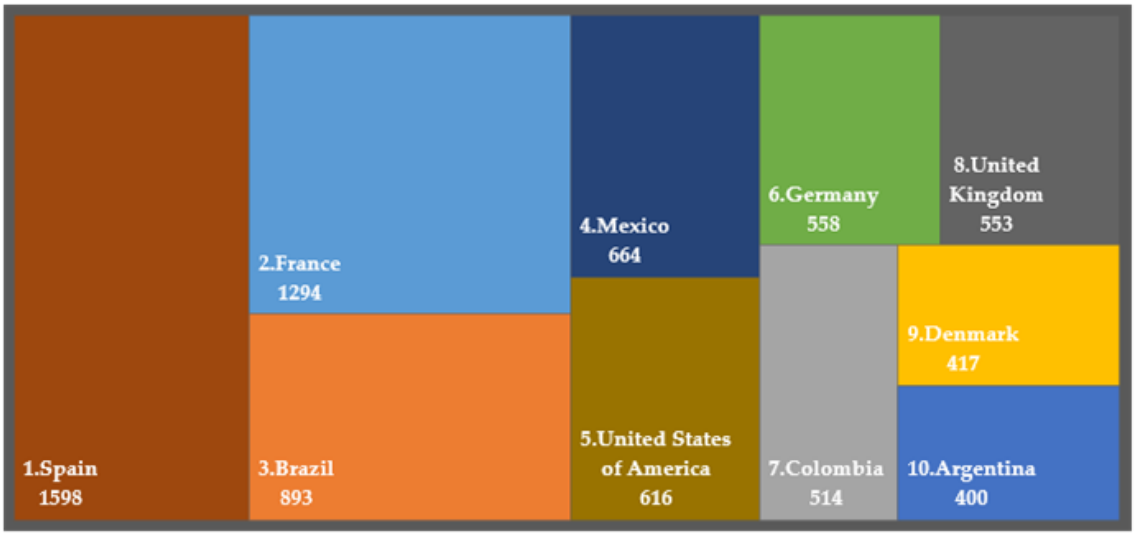
The World Economic Forum (WEF) is an event held annually in January in Davos, Switzerland. The event brings together non-governmental organizations, companies, academics and authorities from the main economies of the world with the aim of discussing socio-political, environmental, and economic issues and promoting public-private cooperation. By the theme of "Stakeholders for a Cohesive and Sustainable World," the event held in 2020 promoted the discussion of several issues of sustainability (mainly environmental sustainability - policies and climate change) among the main world leaders. The great mark of WEF 2020 was the launch of the Davos manifesto, which defends the model of conscious capitalism, focused not only on results for the companies' shareholders, but for all other interested parties, such as society, suppliers, employees, among others. This means a major milestone for advancing CS, as the world's largest economic event in 2020 declared that the performance of companies should be measured by the goals of sustainable development achieved by them. Among the recommendations of the Davos manifesto to companies are the fair payment of taxes, zero corruption, protection of the environment, the valuation of employees, ethical use of

information and commitment to human and worker rights. Besides the manifesto, concrete advances for CS were also achieved at WEF 2020, as an agreement to establish an accounting model for climate impact data, signed by four of the world's largest auditing companies, Deloitte, Ernst & Young, KPMG and PwC (WORLD ECONOMIC FORUM, 2020).

2.3.2.2 Global Compact and SDGs

Created in 2000, the Global Compact (GC) is a voluntary initiative of the United Nations (UN) and the first with the objective of encouraging, guiding and supporting governments and organizations to adopt CS strategies. Its guidelines are based on 10 principles related to human rights, the environment, labor law and combating corruption (UNGC, 2014). The GC is the world's largest corporate sustainability initiative involving more than 10,000 companies from more than 160 countries. Figure 11 shows the top ten countries with the most institutions affiliated to the Global Compact.

Figure 11 - Countries with more "Global Compact" signatory institutions



Source: Nunhes *et al.* (2021).

The countries with more "Global Compact" signatory institutions are Spain, France, Brazil, United States, Germany, Mexico, United Kingdom, Denmark, Colombia and Argentina. GC signatory companies should implement GC principles in their business strategies and daily operations and publish and periodic reports on progress achieved, relating them, if possible, to the SDGs included in the 2030 Agenda for Sustainable Development (CETINDAMAR; HUSOY, 2007; RASCHE, 2009; UNGC, 2014). The 2030 Agenda, proposed in 2015 by the

UN, is an action plan for sustainable development that must be adopted on a global, national and local scale. The agenda defined 17 goals for sustainable development to be achieved by 2030 and proposed 169 targets to measure them (UNITED NATIONS, 2015). The commitment of both companies operating at global and local levels as well as governments are essential for the success of these objectives (UNGC, 2020b).

According to the 2020 report on the progress of signatory companies of GC, 46% of the companies analyzed informed that their business strategies and operations are aligned with the SDGs and that the most adopted actions to meet the principles of the GC are sustainability disclosure (88%), commitment to internal clients (77%), inclusion of the SDGs in corporate policies (72%), definition of measurable sustainable objectives (71%) and inclusion of sustainability values in the code of conduct (71%). The main challenges reported by the companies were to develop a green supply chain, implement sustainable strategies through all the business functions, lack of support from top management and little recognition from investors (UNGC, 2020c).

The UN Global Compact in partnership with the Global Reporting Initiative (GRI) and the World Business Council for Sustainable Development (WBCSD) developed in 2015 a set of guidelines for implementing SDG in business strategy. This is called Sustainable SDG Compass and the main goal is to help organizations to meet the multiple economic, social and environmental demands. In addition to the guide, the SDG Compass provides an online repository with tools and business indicators that can be used by companies from various sectors (GRI; UNGC; WBCSD, 2020). The guide is structured into five steps, which companies should develop in order to incorporate sustainability into business strategies and processes (GRI; UNGC; WBCSD, 2015; MUFF; KAPALKA; DYLLICK, 2017).

The GC has great relevance in the global scenario of CS initiatives, as it encourages and guides organizations in the adoption of sustainable practices. Other important initiatives such as the GRI complement the GC, helping companies comply with GC elements and even presenting detailed cross-referencing between GRI indicators and GC Advanced criteria (UNGC, 2020c). The following topic explains the GRI in more detail.

2.3.2.3 Global Reporting Initiative

The public interest in sustainable development has been demanding transparency from organizations regarding the impacts of activities on the environment and society. This fact is that companies develop tools for analysis and communication of their results in the three pillars of sustainability (CHEN; BOUVAIN, 2009; CHRISTOFI; CHRISTOFI; SISAYE, 2012; LANDRUM; OHSOWSKI, 2018; MAAS; SCHALTEGGER; CRUTZEN, 2016). As a result, several initiatives have emerged to standardize the sustainability disclosure, among which are the guidelines of the International Integrated Reporting Council (IR), the Sustainability Accounting Standards Board (SASB) and the Global Reporting Initiative (GRI), the latter being the most widely used in the world (CHEN; BOUVAIN, 2009; CHRISTOFI; CHRISTOFI; SISAYE, 2012; LANDRUM; OHSOWSKI, 2018).

GRI is an independent organization created in 1997 by the Coalition for Environmentally Responsible Economies (CERES) to support companies and governments in communicating their impacts on climate change, human rights, governance and social welfare. The GRI guidelines were replaced in 2016 by GRI standards, which created a common language for organizations - large or small, private or public - to structure and communicate their impacts on sustainability. The GRI standards represent a major advance in the global comparability of sustainability reports, which are highly relevant to investors, policymakers, capital markets, civil society, among other stakeholders.

The GRI standards are designed to be used together, so they have a flexible and interrelated modular structure. In all there are five modules, being three General Standards (100 series) and 33 on specific topics related to the economic (200 series), environmental (300 series) and social (400 series) dimensions. The GRI standards present distinctions between what is a requirement, recommendation and orientation to declare according to the reporting options - Essential or Comprehensive. The GRI reporting should be based primarily on the material themes of the organization, i.e., the economic, environmental or social themes that actually matter to the company and its stakeholders. Recently, GRI is seeking to align its guidelines with those of the International Reporting Council (IIRC). The integrated reports unite the financial information of companies with their performance in the pillars of sustainability, to enable a systemic and cohesive vision of the creation of the value of the companies in the short, medium and long term (GRI, 2020b; IIRC, 2014).

2.3.2.4 Dow Jones Sustainability Index

Many companies have sought external recognition of sustainability performance due to the need to satisfy the needs of their stakeholders by demonstrating enhanced transparency including their equity in indexes such as the Dow Jones Sustainability Index (DJSI), BOVESPA´s CS Index, Ethical Index Euro, STOXX Global ESG Leaders Index, ECPI, Vigeo, etc. (FEIL; DE QUEVEDO; SCHREIBER, 2017; TALIENTO; FAVINO; NETTI, 2019) and publishing sustainability reports (DIOUF; BOIRAL, 2017; ZSÓKA; VAJKAI, 2018). The DJSI, created in 1999, arose from the pressure from investors who began to point out CS as a crucial factor for business success (SEARCY; ELKHAWAS, 2012). The DJSI is one of the world's most important sustainability indices and aims to measure the performance of previously selected companies regarding economic, environmental, and social criteria.

In the economic dimension, the following criteria must be observed: codes of conduct/compliance/corruption and bribery; corporate governance; customer relationship management; financial robustness; investor relations; risk and crisis management; scorecards/measurement systems; strategic planning; and industry-specific criteria (LO; SHEU, 2007b). In the environmental dimension, the main criteria assessed are environmental policy/management, environmental performance, environmental reporting; and industry-specific criteria. In the social dimension, the main criteria highlighted are corporate citizenship/philanthropy; stakeholders' engagement; labor practice indicators; human capital development; knowledge management/organizational learning; social reporting; talent attraction and retention; standards for suppliers; and industry-specific criteria (LO; SHEU, 2007b).

The selection process of the companies participating in the index is initiated by the Corporate Sustainability Assessment (CSA), which is carried out annually by RobecoSAM. The first step is the selection of the companies that will be invited to participate in the CSA. The CSA result is called "Rated Universe" and corresponds to the companies on which the Total Sustainability Score (TSS) will be based. TSS is then used as a key factor in selecting DJSI participating companies. In 2019 a total of 317 companies were part of the index (GRI, 2020a, 2020b; IIRC, 2014; SIEW, 2015). The companies with the highest scores in this index are Alphabet INC (USA), AT&T (USA), Home Depot (USA), JP Morgan Chase & Co (USA) and Microsoft (USA), which shows a relevant predominance of American companies in the index. Table 8 shows the ten countries with the largest number of companies in the ranking.

Table 8 - Countries with the highest number of companies in the Dow Jones Sustainability Index

Ranking	Country	Number of companies
1	United States	59
2	Japan	33
3	France	25
4	United Kingdom	23
5	South Korea	19
6	Australia	18
7	Spain	16
8	Taiwan	15
9	Germany	14
10	Italy	14

Source: RobecoSAM (2019).

Most of the countries shown in Table 8 are developed countries with strong economies, making it easier for their companies stand out in DJSI. However, they have achieved a high level of development at the cost of an intense use of their natural resources, which has resulted in several negative social and environmental impacts. Most of these countries usually topped the global ranking of the HDI (Human Development Index), however, faced with the recent creation of the “Planetary Pressures-Adjusted Human Development Index” and its inclusion in the calculation of the indicator, a decline was observed of well-placed countries like the United States, which in 2020 fell 45 positions in the HDI ranking (UNITED NATIONS DEVELOPMENT PROGRAMME, 2020).

Thus, the governments of those countries must commit themselves to adopt policies and legislation to foster and support the development of CS [91]. Some efforts and initiatives employed to mitigate these impacts are presented in the next section.

2.3.2.5 Technical government efforts

This topic presents the government efforts focused on encouraging the CS adoption from the three countries with more companies listed in the DJSI (Table 10). These initiatives were identified through a documental analysis of materials published by these governments and public, and private organizations, such as diverse reports, white papers, laws, regulations, and official web pages.

Governments bear a great responsibility in the realization of SDGs, as they are responsible for creating regulatory mechanisms to hold other actors in society accountable for sustainable development (ADAMS; SMART; HUFF, 2017; BEARE; BUSLOVICH; SEARCY, 2014; BONILLA et al., 2010; LYON et al., 2018). Therefore, the growing public interest in environmental and social issues has led many governments to adopt policies to promote CS practices, rewarding socially and environmentally responsible companies and penalizing those who act irresponsibly in this regard (MOFFAT; AUER, 2006). Most policies developed by governments are based on three types of strategy: risk management and regulatory systems with the definition of codes of conduct, which if not met are punishable; initiatives to disclose information with the encouragement of integrated reporting and sustainability; and financial and technological support for the use of CS tools (BEARE; BUSLOVICH; SEARCY, 2014; MOFFAT; AUER, 2006). According to a KPMG survey (2020), almost 400 (66%) of CS initiatives are governmental initiatives, while 125 are initiatives from financial market regulators (20%) and the remaining (14%) come from the Stock Exchange, industry, companies and non-governmental entities. The majority of government initiatives are mandatory and have focused on encouraging the dissemination of social and environmental results and on the quality and usefulness of the data in the reports, defining guidelines to guide companies towards their preparation (KPMG et al., 2016).

Among the countries with the highest number of companies listed on the DJSI *Table 8) the United States (USA) ranks first. The country maintains the Responsible Business Conduct (RBC) team that guides, promotes and supports the adoption of responsible business practices in the private sector, labor groups, non-governmental organizations and governments of other countries. One way to foster CS in the US is through the Corporate Excellence Award (ACE), offered in three categories: (1) environmental sustainability, (2) human rights and labor rights, and (3) for small and medium enterprises (UNITED STATES OF AMERICA, 2016). Japan is the second country with the most companies in DJSI and its government (2018) encouraged leading national organizations to participate in the Paris Agreement. The government has created an environment for cooperation among stakeholders and has funded projects to reduce greenhouse gas (GHG) emissions. This has yielded results such as Ricoh, a company that produces multifunction printers among other technology products intend to use at least 30% renewable energy by 2030 and 100% by 2050; Panasonic Corporation, which is present in the domestic, housing and automotive products market, is working to build manufacturing plants with zero CO2 emissions (JAPAN, 2018). In 2019, the Japan Ministry of Economy created a group called "Dialogues for Creation of Sustainable Corporate Value Compiles Interim Report"

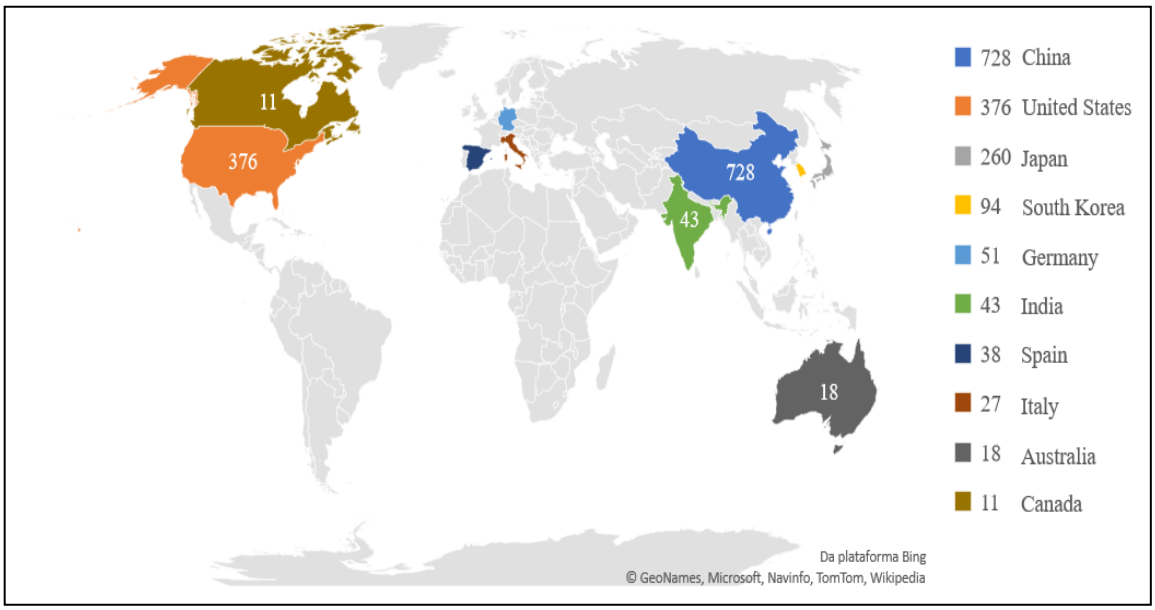
with the objective of promoting relations between companies and investors for improving medium and long-term sustainable corporate value (JAPAN, 2020). In addition, in 2018 Sumitomo Mitsui Banking Corporation (SMBC) initiated a loan program for SMEs that prepared a management plan focused on SDGs. In partnership with the Japan Research Institute (JRI) consultancy was offered to help companies ensure reliability and objectivity in the management plans developed. It is expected that programs like this be developed in other countries, as it was announced by the official website of the UN SDGs as an innovative approach aimed at SMEs that has not been adopted so far (UNITED NATIONS, 2018).

France, the third country with more companies listed on the DJSI, established in 2001 the Corporate Social Responsibility Regulatory Framework with the objective of encouraging companies to present information regarding the environmental and social impacts resulting from their activities. In 2009, laws were created that made it mandatory for organizations to report social and environmental information to their stakeholders. In 2015, the government of France enacted a law that instituted reports on climate and energy, circular economy and food waste. In 2017, a mandatory non-financial information publication was introduced for large companies (FRANCE, 2019). The initiatives undertaken in France have had fundamental support from the European Union, which has adopted important measures to promote CS in countries that are members of the economic bloc. For example, in the European Union there is a directive (2014/95/EU) that obliges companies with more than 500 employees to report non-financial results of their activities (TALIENTO; FAVINO; NETTI, 2019). Therefore, government initiatives stand out for their ability to encourage other sectors to develop and implement CS practices, serving as catalysts in the pursuit of sustainable development.

2.3.2.6 Patents and innovations for CS development

The intellectual property system is one of the most widely used to encourage private R & D (R&D) initiatives for innovations in many countries (HALL; HELMERS, 2013). Therefore, the analysis of patents allows the identification of the main countries, companies and universities with R&D initiatives for innovations in the theme being studied and trends in the development of technologies for the coming years (DAIM et al., 2006). The numbers of patents registered in the last 20 years point to China, United States, Japan, South Korea, Germany, India, Spain, Italy, Australia and Canada as major references in R&D for CS (Figure 12).

Figure 12 - Top ten countries that most registered patents for CS in the last 20 years



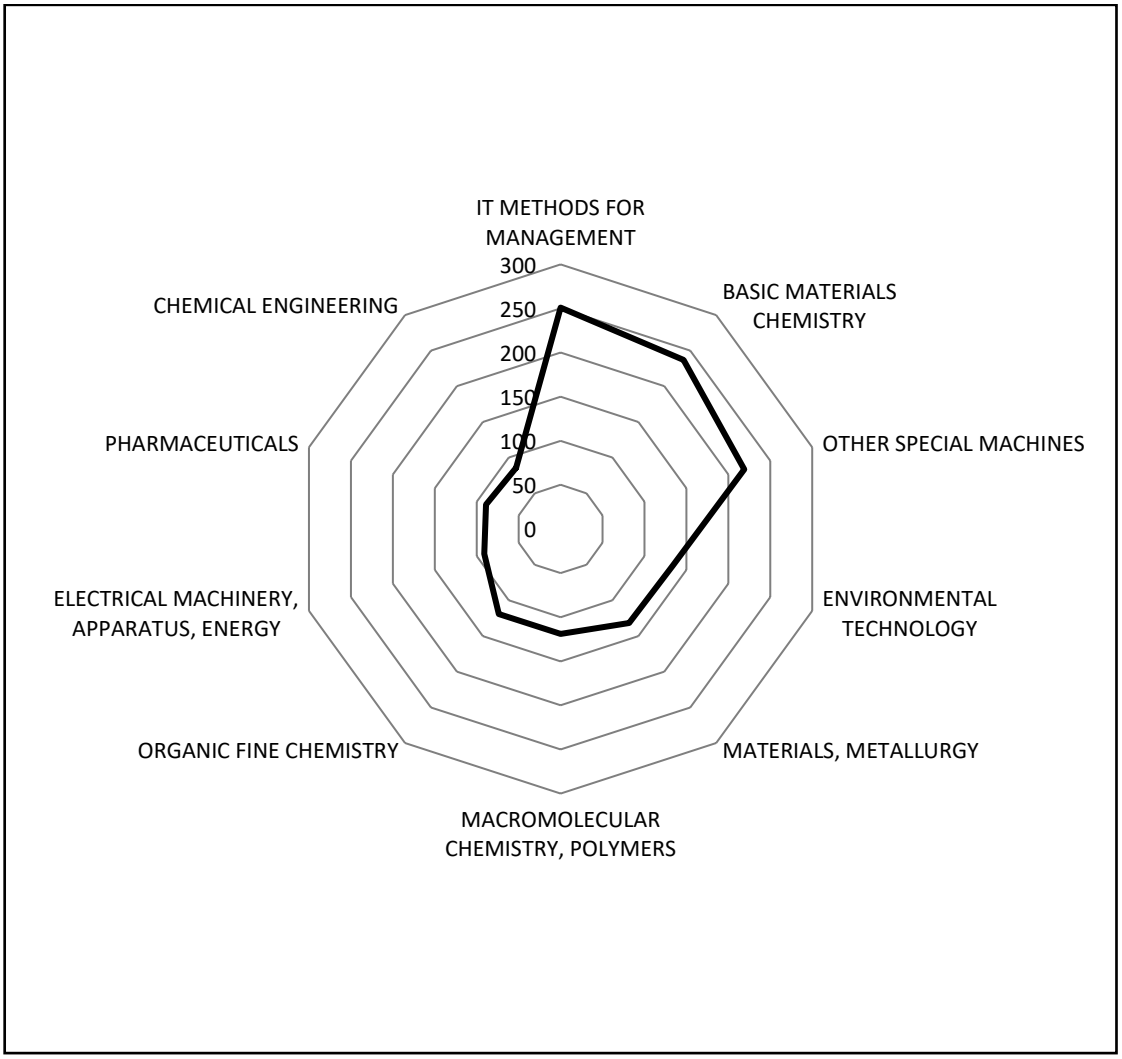
Source: Orbit Intelligence (2020).

China is the country with the highest number of patents (66%) among the top ten countries of Figure 12. This country has invested heavily in the development of sustainable technologies; however, Chinese companies still appear little in the DJSI, which shows the need for them to be more transparent about the disclosure of their initiatives and impacts on sustainability.

Despite this, there are 8 countries in common with the list of the DJSI, which indicates the importance of commitment to the development of technologies for CS for achieving good CS performance. The solutions developed from these patents can be classified according to their technological domains.

Figure 13 presents the major domains of CS patents registered in the last 20 years. The domains represent the categories of the technologies developed. The most recurrent domain is "IT methods for management", refers to solutions aimed at measuring and mitigating the environmental impacts of companies through information technologies. The other prominent domains permeate various industrial sectors, such as civil, mechanical, and chemical industries.

Figure 13- Top ten technological domains of CS patents



Source: Orbit Intelligence (2020).

This highlight shows that organizations in these sectors are the ones that are most committed to developing sustainable technologies. Table 9 shows the three companies listed on the DJSI that registered the most patents on CS in the studied period, their sectors of activity and the domains of the patents registered.

Table 9 - Companies listed on the DJSI that registered the most patents

Company/Country	Sector	Domain	Number of Patents
Shin Etsu Chemical (SEC) /Japan	Chemical	Handling	6
		Macromolecular Chemistry, Polymers	5
		Basic Materials Chemistry	2
		Chemical Engineering	1
		Other Special Machines	1
Protector & Gamble (P&G)/ USA	Consumer goods	Handling	9
		Organic Fine Chemistry	6
		Chemical Engineering	5
		Macromolecular Chemistry, Polymers	1
		Basic Materials Chemistry	1
Amorepacific/ South Korea	Cosmetics and Aesthetics	Organic Fine Chemistry	9

Source: Orbit Intelligence (2020).

Shin Etsu Chemical (SEC) has been a member of the UN Global Compact since 2010 and is highly committed to environmental, social and corporate governance (ESG) practices (SHIN-ETSU GROUP KEY, 2020a, 2020b, 2020c). The SEC has an R&D sector focused on the development of new materials and technologies that allow the reduction of the use of energy, raw materials and promote the use of renewable energy (SHIN-ETSU GROUP KEY, 2020d). The SEC participates in international initiatives to combat global warming, such as the Task Force on Climate-related Financial Disclosures. In addition, in 2019 it created the "The Shin-Etsu Group Human Rights Policy" that promotes research to identify risks to human rights in the company, creating action plans to mitigate them (SHIN-ETSU GROUP KEY, 2020e, 2020f). The company has a committee to promote ESG practices responsible for identifying and adopting CS initiatives and auditing their implementations (SHIN-ETSU GROUP KEY, 2020g, 2020a).

In 2018 Protector & Gamble (P&G) launched the "Ambition 2030" initiative, an agenda with objectives to be achieved by the company by 2030. The objectives are focused on four areas: Brands, Society, Employees and Supply Chain. P&G has sought to reduce the emission of polluting gases and the use of electricity and water, replace energy sources with renewable energy and make all the packaging of its products recyclable. In the social sphere, the company has developed actions to engage employees in CS initiatives based on training, benefit programs

and incentives for volunteering, in addition to promoting social actions in needy communities on the African continent and in India. The company also promotes actions for inclusion, diversity, and gender equality. P&G conducts frequent audits to assess the results of its initiatives and to identify development opportunities (PROCTER & GAMBLE, 2019a, 2019b).

Amorepacific has been listed on the DJSI Korea index for nine consecutive years and has been part of the UN Global Compact since 2007. In 2020, the company launched the "Sustainable Operations Goals" program with goals to be achieved in the three pillars of sustainability from initiatives to be taken in three main areas: Sustainable Lifestyle, Circular Economy and Inclusive Growth (AMOREPACIFIC GROUP, 2020). In the area of inclusive growth, the company invests in welfare and health programs for its employees and in social projects for promoting welfare, health, and financial empowerment of more than 200,000 women. Finally, in the Circular Economy area, the company reduces C02 emissions by 30% per ton of products produced and improve the efficiency of resource use through reuse, recycling and adoption of clean technologies (AMOREPACIFIC GROUP, 2018, 2019).

The analysis of the profile of the sustainability practices of companies that have registered the most patents related to CS makes it possible to perceive a concentration of domains in the chemical sector, which seeks to adopt new socially and environmentally friendly technologies and products to mitigate the impacts of the activities on the environment and on the health, safety and welfare of employees and society. Thus, the other sectors should adopt a proactive stance toward sustainable development and be encouraged to do so by the governments of the countries in which they operate and by their own value chain, as is the case with the chemical, construction, paper and pulp sectors and others whose operations significantly impact the environment.

2.4 CORPORATE SUSTAINABILITY FRAMEWORK

The proposed corporate sustainability framework brings together initiatives to be adopted by Triple Helix sectors (universities, governments, and organizations). The results were obtained from the analysis of the STC-CS in light of the scientific and technical literature and the experience of the authors of the study. The framework is composed of initiatives expanded and adapted to the domains of the Triple Helix sectors with the objective of overcoming the challenges for its adoption. **Erro! Fonte de referência não encontrada.**Table 10 presents the p roposed framework with initiatives segmented by sector and domain.

Tsble 10 - Framework for CS development

(continues)

Sector	Domain	Proposal	Triple-Helix Connection	Scientific and Technical References
Universities	Education	Create CS-training courses at all levels (undergraduate/postgraduate/extension)	Government and Organizations	Leuphana University (2020); Ryerson University (2020); Birkel et al.(2019)
		Integration of SDG into curricula covering as many of the "goals" as possible in order to systemically foster sustainability	Government	Birkel et al. (2020); University of Leeds (2020); Barros et al. (2020)
	Research	Develop research that promotes a better understanding of the concept of sustainability in companies	Organizations	Pechancová et al. (2019); Canada (2015); Brasil (2020)
		Identify research opportunities that meet the interests of society and promote the development of CS	Government and Organizations	Brozzi et al. (2020); Canada (2018)
		Develop studies to reduce the carbon footprint by developing green products and green processes, and using renewable energy, such as solar panels and wind turbines	Government and Organizations	Pechancová et al. (2019); Ryerson University (2020)
		Conduct research on the relationship between Industry 4.0 and sustainability	Government and Organizations	Brozzi et al. (2020); Amui et al. (2017)
	Management	Engage university leaders in obtaining funding and establishing partnerships for CS research	Organizations	Brasil (2020); Canada (2018); Pauer et al (2020)
		Implement a solid waste management program, giving priority, respectively, to the reduction, reuse and recycling of solid waste	Government	Ridhosari and Rahman (2020); University of Leeds (2020)

Table 10- Framework for CS development

(continues)

Sector	Domain	Proposal	Triple-Helix Connection	Scientific and Technical References
	Politics and Legislation	Alina national public policies with SDGs to facilitate the implementation of SDGs by companies	Organizations	Cardillo and Longo (2020); Japan

				(2020); Fonseca et al. (2019)
Government		Include sustainability in government plans for industry 4.0	Organizations and Universities	Bonilla et al. (2018)
		Draft laws to foster corporate sustainability, for example, regulating the publish reports on socio-environmental actions	Organizations	France (2020); Landrum and Ohsowski (2018)
		Create policies and plans to foster the use of renewable energy	Organizations and Universities	Wolff et al. (2020); Japan (2020)
		Create legislation to reduce the emission of gases and generation of polluting waste in industry	Organizations	USA (2017); Ghalehkhondabi (2020)
		Create legislation to guarantee workers' rights and adequate working conditions	Industry	USA (2017); Ramos et al. (2020)
		To monitor and disclose annually the evolution of the implementation of SDGs in the business sector	Organizations	Pham (2020); France (2020)
	Public Management	Promote awards and recognitions for public and private companies with outstanding sustainable performance	Organizations	USA (2017)
		Create projects for society participation in the suggestion of initiatives for developing CS	Organizations and Universities	Japan (2020)
		Establish fees, tariffs, or fines on excess emissions of pollutant gases	Organizations	Taliento (2019)
		Financing research projects in universities and companies in the CS area	Universities	Brasil (2020); Canada (2018)
	Economy			
		Enable loans to SMEs that present management plans strategically integrated with SDGs	Organizations	Lyon (2018); Ammasaiappan (2017)

Table 10 - Framework for CS development

(conclusion)

Sector	Domain	Proposal	Triple-Helix Connection	Scientific and Technical References
Organizations	Planning and Management	Integrate SDGs into organizations' strategic plans	Government and Universities	Perchinunno and Cazzolle (2020); Nunhes et al. (2020)
		Create governance processes that help integrate CS into the company's strategy according to the reality of the countries in which they operate	Universities	Roca and Searcy (2012); GRI UNGC WBCSD (2020)
		Establish partnerships with universities and research centers for developing sustainable technologies and processes	Universities	Shin Etsu Chemical (2020); Pauer et al. (2020)
		Foster the suggestion of ideas and support the development of socio-environmental projects	Government and Universities	Protector & Gamble (2019); Amorepacific (2020)
		Measuring sustainability performance from sustainability indices	Universities	Lozano (2015)
	Operations	Develop programs to promote worker health and safety and identify risks to employees' rights	Government and Universities	Amorepacific (2020); Shin Etsu Chemica (2020)
		Prepare and publish sustainability reports	Government and Universities	Papoutsi (2020)
		Include sustainability criteria in product development processes	Universities	Pechancová (2019); Shin Etsu Chemica (2020)
		Use Industry 4.0 technologies to improve business performance on sustainability pillars	Government and Universities	Bag et al. (2018)

Source: Author (2020).

As shown in Table 10, the actions proposed for the “Universities” sector are segmented into three domains: "Education," "Research" and "Management". In the first of them, the need to train students on CS through transversal integration SDG in the curricula of all undergraduate courses is discussed. In addition, it is proposed the creation of undergraduate, graduate and extension courses with a specific focus on CS as a way to develop professionals trained to create strategies, develop and manage sustainability in organizations (BIRKEL et al., 2019; LIAO; WARNER; HOMSY, 2020). For the "Research" domain, the development of research is recommended to allow a better understanding of the concept of CS, reduction of the carbon

footprint, development of green products and green processes, use of renewable energies and analysis of the relationship of industry 4.0 with CS. In addition, the development of research on CS is proposed with practical applications in municipalities and universities, since CS practices can bring benefits for a more sustainable management in these sectors (BROZZI et al., 2020; PAUER; PILON; BADELT, 2020; PECHANCOVÁ et al., 2019; RIDHOSARI; RAHMAN, 2020). Universities also need to include CS in the "Management" domain, which involves engaging leaderships with the inclusion of CS in the strategic planning of educational institutions through the implementation of the aforementioned actions in "Education" and "Research" domains and, additionally, giving priority to solid waste management (AMARAL et al., 2020; RIDHOSARI; RAHMAN, 2020).

The proposed actions for "Government" sector were segmented into the following domains: "Politics and Legislation," "Public Management" and "Economy." For the first domain, governments are recommended to draft laws to promote CS, regulating the publish reports on socio-environmental actions, making it mandatory, for example, for large companies and groups to disclose non-financial information and information on diversity, as established in Europe by Directive (EU) 2014/95. Governments are also suggested to create regulatory plans and policies for developing industry 4.0 considering sustainable development as an essential and indispensable aspect for the progress of the economy, facilitating access to renewable energy sources and reducing gas emissions and the generation of polluting waste (BARROS et al., 2020; CARDILLO; LONGO, 2020; FONSECA; CARVALHO, 2019; HOPKINSON; DE ANGELIS; ZILS, 2020; KAMBLE; GUNASEKARAN; GAWANKAR, 2018; LANDRUM; OHSOWSKI, 2018; RAMOS; AFONSO; RODRIGUES, 2020). For the second domain, `Public Management', it is recommended that governments monitor and publicize annually the evolution of the implementation of SDGs in companies, promote awards and recognition for public and private companies that present outstanding performance in sustainability and actively engage society in this process through the creation of programs and suggestion channels to promote CS (PHAM; JUNG; LEE, 2020; WOLFF et al., 2020; ZAHID et al., 2019). The proposals of the third domain, "Economy," are strongly aligned with those of the first domain, "Politics and Legislation," given the direct interconnection between them. Specifically, the third domain for the "Government" sector highlights the creation of fees, tariffs or fines on surplus emissions of pollutant gases, financing research projects in the area of CS and facilitating conditions of loans to SMEs that present management plan of SDGs (AMMASAIAPPAN, 2017; GHALEHKHONDABI; ARDJMAND, 2020; GRI; UNGC; WBCSD, 2015; LYON et al., 2018).

Finally, the areas of the actions proposed for TH's "Organizations" sector are "Planning and Management" and "Operations." In the first, organizations should prioritize the integration of SDGs in their strategic planning, the creation of governance processes that support the integration of sustainability with the strategy according to the reality of the countries where they operate, the establishment of partnerships with universities and research centers for developing sustainable technologies and processes, and the creation of programs to suggest ideas to support the development of socio-environmental projects (NUNHES; BERNARDO; OLIVEIRA, 2020; PERCHINUNNO; CAZZOLLE, 2020; ROCA; SEARCY, 2012). In the second domain, "Operations," the measurement of sustainability performance from sustainability indices is proposed, development of programs to promote worker health and safety and identification of risks to employees' human rights, preparation and publication of sustainability reports, inclusion of sustainability criteria in product development processes and use of Industry 4.0 technologies to improve business performance in the pillars of sustainability (AKSOY et al., 2020; BAG et al., 2018; LOZANO, 2015; PAPOUTSI; SODHI, 2020; PECHANCOVÁ et al., 2019).

Table 10 also shows some examples of connections that should occur between “universities”, “government”, and “organizations”. In this regard, for instance, “universities” could receive financial support from “governments” and “organizations” for maintaining CS research labs and training professionals to manage CS. “Organizations” and “universities” could work together with “governments” in the creation of technological parks and integrated projects to accelerate innovation and production of patents by means of the development of startups able to offer sustainable solutions. These and other type of articulations between the TH sectors could open paths to companies move towards sustainable business development.

2.5 CONCLUSIONS

The main objective of this research was achieved because the set of analyses of the STS-CS allowed the elaboration of a framework to advance with the development of the CS with propositions structured for "Universities," "Governments" and "Organizations." The cooperation between these three sectors of TH is necessary for the effective incorporation of sustainability in organizations because through properly coordinated efforts, it will be possible to develop CS not as branding, but as a transformation initiated with the strategy and realized with more sustainable operations, projects and products that have less negative impact on the environment and society.

Universities play a fundamental role in the formation of a critical mass capable of acting for developing CS. However, there is a shortage of qualified professionals to manage sustainability in companies, and this is a point of attention that needs to be urgently addressed. Therefore, CS should be systematically addressed in all professional and academic training courses, with special emphasis on business and administration courses, which train decision makers. In this sense, the CS is approached in an interdisciplinary and not isolated manner, that is, as one more curricular component. It should be discussed consistently throughout the course to train professionals truly committed to sustainable development. The development of the CS also depends directly on initiatives of public management, represented by the governmental sphere of TH. Public authorities should include CS as a priority in their strategic development agendas, channeling technical and financial resources and creating legislation to foster its insertion in companies.

The main academic contribution of this work is the upgrade of the scientific block of knowledge on CS with structured propositions for the TH sectors that expand and deepen research aimed at contributing to sustainable business development. As for the applied contributions, companies can identify business opportunities to increase their profits in a sustainable way, governments can find suggestions for public measures for the development of CS and universities can identify recommendations for training professionals capable of managing socio-economic issues and developing partnerships with companies for innovation and development of sustainable products and processes. The identification and analysis of the technical and scientific scenarios, together with the interpretations and experiences of the authors of this work adds to the body of knowledge a framework adjusted for the development of CS, balanced and consistent with the technical-scientific realities.

In this study, CS was approached from different standpoints, i.e., in a systemic way and not limited to academia or government or market alone. This integrated approach to CS is the main novelty of the work, which brought the multiplicity and interchangeability of views on CS considering the 3 TH. Sectors. The limitation of this study is related to the criteria selected in the search and analysis of the data, which if changed, could return slightly different results. Therefore, it is suggested that future studies use other combinations of criteria and metrics to identify good CS practices, e.g., analysis of relative data rather than absolutes taking into account the number of publications and patents per capita in country analysis. Another limitation is that it addressed important CS initiatives in the general context of sustainability, and may have failed to address important sectoral initiatives. Then, other studies could consider the joint analysis of the scientific and technical scenarios for developing CS with other analysis

variables and more specific geographic and sectorial segmentations that may require adaptations to the triple helix model, which may become the quadruple Helix or quintuple Helix. Future studies could also make a more in-depth analysis of the scientific scenario of CS, including among other analyses, that of dominant theories applied in the development of the theme and the analysis of the hot topics identified in this study, such as the development of CS supported by the application of digital technologies big data, cybernetics, artificial intelligence, sensors and robotics.

3 ANALYSIS OF INTEGRATED MANAGEMENT SYSTEMS RESEARCH: IDENTIFYING CORE THEMES AND TRENDS FOR FUTURE STUDIES

The article resulting from this step (NUNHES; OLIVEIRA, 2018) was published in the "Total Quality Management and Business Excellence" journal and is presented throughout this chapter.

3.1 INTRODUCTION

The individual implementation of MSs is an option that can lead to an overall sub-optimization of the systems (ISO, 2008). The MS integration phenomenon began as soon as more than one MSs standard became available for certification. Thus, the coexistence of two or more parallels MSs in the same organization looked like a poor approach and contradicted the best practices of management (DOMINGUES et al., 2016a; OLIVEIRA, 2013). In this context, the holistic view of IMSs has emerged as a more effective and efficient way to meet the stakeholder's requirements.

In the literature, the integration of MSs has been discussed as a fusion of QMSs, EMSs, OHSMS, CSRMS, Information Security Management, among others, with a special focus on the first three MSs (REBELO; SANTOS; SILVA, 2016; SANTOS; MENDES; BARBOSA, 2011; ZENG; SHI; LOU, 2007). The integration process of such systems has been enhanced by the increased compatibility among the new versions of the MSs standards (SATOLO; CALARGE; CAUCHICK MIGUEL, 2013).

As standardized MSs share similar management techniques (FRESNER; ENGELHARDT, 2004; ZENG; SHI; LOU, 2007), its integration may reduce costs and redundancies, while implementing these standards in parallel demands duplicate efforts (ZENG et al., 2011). However, for the benefits to be realized it is essential that organizations are aware of the barriers, challenges and obstacles of integration (ASIF et al., 2013).

Motivations, benefits and obstacles regarding integration, models and guidelines for IMS, implementation strategies, levels of integration are some topics that have been extensively discussed by academic community over the last years. Domingues et al. (2016) emphasized that studying IMS is particularly relevant if one considers the revisions of ISO 9001 and ISO 14001 standards, both published in 2015 in accordance with the high-level structure of ISO Annex SL, which provides identical core text, as well as common terms and definitions for all MS standards (ISO, 2020).

According to the data from the Scopus and Web of Science publication databases, more than 120 papers have been published on the IMS subject after 2005. Although much attention has been paid to research's development, so far, no paper attempted to gather data systematically and conduct analysis of these published scientific studies. Towards this scenario, this paper presents a bibliometric study of 123 scientific publications in the IMS domain dating from 2005 to 2015. The objective of this study is to investigate core themes, gaps and trends in the IMS research area from a bibliometric study. To achieve it, through this study the IMS articles were analyzed in terms of distribution by journals, year of publication, methodologies and most widely occurring topics researched.

Following this brief introduction, section 3.2 presents a synthesis of theoretical framework about Certifiable MSs and IMSs. Section 3.3 describes the methodological procedures used to perform the study, followed by section 3.4 that discusses the results of the bibliometric analysis and presents the gaps and trends on IMS research area. Finally, section 3.5 presents the conclusions, limitations, and research opportunities arising from this study.

3.2 THEORETICAL FRAMEWORK

3.2.1 Certifiable Management Systems

Over the last years, tendencies of many organizations devote their corporate resources to evaluate, monitor and implement new management standards across the organization were noted (SU; DHANORKAR; LINDERMAN, 2015). The certification of a MS is the recognition that it meets a specific normative standard. In this sense, the implementation and certification of quality, environmental and occupational health and safety MSs by, respectively, ISO 9001, ISO 14001 and OHSAS 18001, have become a priority for many organizations (OLIVEIRA, 2013; ZENG; SHI; LOU, 2007).

ISO 9001 certification for QMS represents the most successful standard, with 1.1 million worldwide certificates by 2015 (CLOUGHERTY; GRAJEK, 2014; PRIEDE, 2012). ISO 14001 is one of the most widely used voluntary approaches involves the adoption of the certified EMS (ARIMURA et al., 2016; OLIVEIRA; SERRA; SALGADO, 2010; PRAJOGO; TANG; LAI, 2012). According to the International Organization for Standardization (ISO), up to December 2014 there were 324,148 organizations worldwide certified according to ISO 14001 (ISO SURVEY, 2019).

The OHSAS 18001 is available since 1999 and is currently widely adopted by organizations around the world and since its creations is recognized as the most international used standard for evaluating safety management processes (ABAD; LAFUENTE; VILAJOSANA, 2013; LO et al., 2014; VINODKUMAR; BHASI, 2011). As the ISO 14001 and ISO 9001, the structure of OHSAS 18001 is based on the PDCA cycle (MOHAMMADFAM et al., 2016; OLIVEIRA, 2013). This similarity should increase in 2018, when OHSAS 18001 is expected to also become an ISO standard, the ISO 45001 (BSI, 2016).

The main challenges concerning to ISO 9001 are employee resistance, lack of understanding the standard by all the departments and other problems related to organization culture (MAGD; NABULSI, 2012). The main difficulties commonly faced by organizations that have implemented ISO 14001 is the cost increase (people and fund) and the difficulty of perceiving improvements in environmental performance, especially in waste reduction (OLIVEIRA; SERRA; SALGADO, 2010; PRAJOGO; TANG; LAI, 2012; SINGH; BRUECKNER; PADHY, 2015). Regarding the OHSAS 18001 there are controversies as to its effectiveness in reducing occupational risks at workplace, which might be due to difficulties that organizations faced in its implementation process, such as improper audits with too much paperwork and inappropriate measurement tools which are based on subjective and intangible data (HASLE; ZWETSLOOT, 2011; REZAEE-ZAVAREH, MOHAMMAD SAEID; KHOSRAVI, MOHAMMAD HOSSEIN; ALAVIAN, 2016).

The most recent version of ISO 14001, as for ISO 9001, was published in September 2015 and brings some key changes and novelties concerning concepts, terms and definitions. Among the new concepts for which the revised versions of standards draw attention are the Risk Based Thinking, Interested Parties, Change Control, Strategic Direction, and Knowledge Management and Leadership (FONSECA, 2015; MANDERS; DE VRIES; BLIND, 2016). These changes aim to foster the development of communications strategy, lifecycle thinking, greater focus on leadership, more focus in strategic planning, increased flexibility in the use of documentation processes, etc. (ISO, 2018).

The changes in terminologies resulted in the use of the term "documented information" instead of "documents and records", "external provision" instead of "outsourcing", "goods and services" instead of "product", “exclusions” is not used anymore, “work environment” is now “environment for the operation of process”, and “purchased product” changed to “externally provided products and services” (CHEN et al., 2016; FONSECA, 2015).

In short, the revised ISO standards and their changes are viewed positively because they are more performance-focused, more appropriate to respond to the dynamic environment in

which organizations are embedded and inclusive to sectors like Services and Small and Medium Enterprises (FONSECA, 2015; RYBSKI; JOCHEM; HOMMA, 2017). However, one of the major challenges for organizations to adapt their MSs to the new versions of the ISO standards is the need for planning and actions in the field of knowledge management and risk management (RYBSKI; JOCHEM; HOMMA, 2017).

3.2.2 Integrated Management Systems

Integration is the alignment of the MSs through the elimination of mutual overlapping contents by enhancing the use of a uniform language to improve stakeholder satisfaction (OLIVEIRA, 2013). It is considered the best management practice when an organization has multiple MSs in place (BERNARDO; SIMON, 2014).

According to Bernardo et al. (2012), the number of organizations that are implementing certifiable MSs in order to meet the requirements of the interested parties and achieve maximum efficiency is increasing. Furthermore, Salomone (2008) pointed out that many of these organizations are advancing towards integration.

The integration of several MSSs versus individual MSs constitutes added value both in the present and in the future (REBELO; SANTOS; SILVA, 2016). In this context, the benefits of implementing IMSs include improvement in the effectiveness of operations and internal communication, decreased bureaucracy, greater ease of decision making, decreased management costs, improvement quality of goods and services, improvement in customer satisfaction, among others (OLIVEIRA, 2013; SIMON; KARAPETROVIC; CASADESUS, 2012; ZENG et al., 2011).

On the other hand, some highlighted difficulties faced during the process of IMS implementation are related to insufficient harmonization of the standards, fear of job loss as a result of amalgamation , lack of support from the certification bodies , fear and resistance to change as well as loss of “ownership” of systems, and problems related to the organizational culture (ASIF et al., 2009; SCHALTEGGER; BECKMANN; HANSEN, 2013; ZENG; SHI; LOU, 2007).

In relation to implementation-related practices, Pereira-Moliner et al. (2012) analyzed literature on QMS and EMS. According to the authors, EMS mediates the relationship between QMS and financial performance and market success. Moreover, Oliveira (2013) suggested that the previous implementation of QMS can make EMS implementation easier because QMS practices foster the development of EMS practices.

Regarding EMS and OHSMS, Luo, Li and Li (2015) argued that both are based on risk and control of environmental factors and on PDCA structure. Further, EMS and OHSMS are focused on risk control, which is dynamic and require changes in operation activities, facilities and personnel, in order to achieve the purpose of controlling risk and environmental factors. The literature also suggests that OHSMS can reflect in other MSSs, i.e., “when a system is safe, workers trust management and can focus on their jobs; the production system should be in control which is a critical condition for outcomes such as quality; therefore, costs will be reduced” (LO et al., 2014).

Bernardo et al. (2012) discuss four key aspects in the process of integrating MSs: implementation strategy, integration methodology, level of integration and audit integration. According to Lopez-Fresno (2010), the implementation process of an IMS can follow basically three strategies: (1) Establish QMS first and subsequently EMS, OHSMS and others; (2) Establish EMS first and subsequently QMS and (3) Establish EMS and QMS simultaneously.

Reflecting the first alternative strategy, results of existing empirical studies have indicated that the majority of organizations that integrate their MSs implement QMS first, and then EMS and other MSSs, as the OHSMS (BERNARDO, 2014; SANTOS; MENDES; BARBOSA, 2011; ZENG et al., 2005). In most cases, it happens due the sequence of implementation, which trails the publication of standards. Thus, namely ISO 9001-based QMS is introduced first, followed by ISO 14001 EMS and by OHSAS 18001 OHSMS implemented individually or simultaneously (BERNARDO et al., 2012a; KAFEL; CASADESUS, 2016; SANTOS; MENDES; BARBOSA, 2011).

Although methodologies for integration of MSs have been proposed both by academia and by certification bodies (BERNARDO; SIMON, 2014), the literature does not present a consensus of a single/standardized methodology. Thus, organizations have just implemented their IMS based in a methodology that “suits it best”, what leads them to achieve different integration levels (BERNARDO et al., 2009; DOMINGUES et al., 2016b).

This issue was approached by Jorgensen et al. (2006), who argues that three-ambition levels of integration have emerged as a result of various approaches to integration. They are the "correspondence" level, which is characterized by increasing compatibility between parallel systems. The "coordinated" level, when IMS works with generic processes and is focused on tasks in the management cycle and the "strategic" level, in which the IMS presents “an organizational culture of learning, continuous improvements of performance and stakeholder involvement related to internal and external challenges”.

In addition, Bernardo et al. (2012) empirically investigated the relationship between the difficulties found in the integration process and the level of system integration achieved. In this study, a sample of 362 organizations certified, at least, to both ISO 9001:2000 and ISO 14001:2004 were examined. The findings showed that the effectiveness of implementation models varies depending on the number of MSs implemented, that is, organizations with three implemented MSs may face significant difficulties on the integration process that affect the level of integration. In contrast, organizations with two MSs are more likely to conduce it without important problems. In this sense, empirical studies have indicated that one of the main causes that have inhibited the coordination of the integration process is the difficulty with the standards (BERNARDO et al., 2012a; JORGENSEN et al., 2006).

The standards are revised continuously and in each new updated version ISO has intentionally presented a better compatibility and synergy between them (SANTOS; MENDES; BARBOSA, 2011; SATOLO; CALARGE; CAUCHICK MIGUEL, 2013). Kraus and Grosskopf (2008) emphasized that ISO aims to harmonize ISO 9001 with ISO 14001 and that ISO 14001 appears to act as the basis (or model) for the structure of OHSAS 18001.

The publication of Annex SL by ISO came to consolidate this tendency of compatibility between standards, enhancing the use of integrated practices and making its integrated use simpler. The annex SL is the ISO high-level structure that presents a similar structure, text and common terms and definitions for all MS standards (DOMINGUES et al., 2016b; ISO, 2018).

Annex SL is applied to all MS standards, such as full ISO standards, Publicly Available Specifications (PAS) and Technical Specifications (TS) (BSI GROUP, 2016). ISO 9001 and ISO 14001, both updated in 2015, have already been revised following this new outline. Moreover, the new ISO 45001 (Occupational health and safety management systems – Requirements) will also be published based on Annex SL's high-level structure.

Bernardo et al. (2009), who empirically analyzed the integration levels of IMSs in a sample of 435 Spanish organizations, concluded that organizations begin the integration mostly with the strategic goals, documentation and procedures, i.e., policy, objectives and manual in the case of the goals and documentation, and record control, internal audits and internal communication for procedures. The integration of operations and tactics are made later on. Corroborating, Oliveira (2013) argues the process of integration has to be conducted based on structural elements that will guide all actions and resources in a common direction. These elements that need to be firstly integrated are: scope, policy, objectives, and responsibilities.

3.3 RESEARCH METHOD

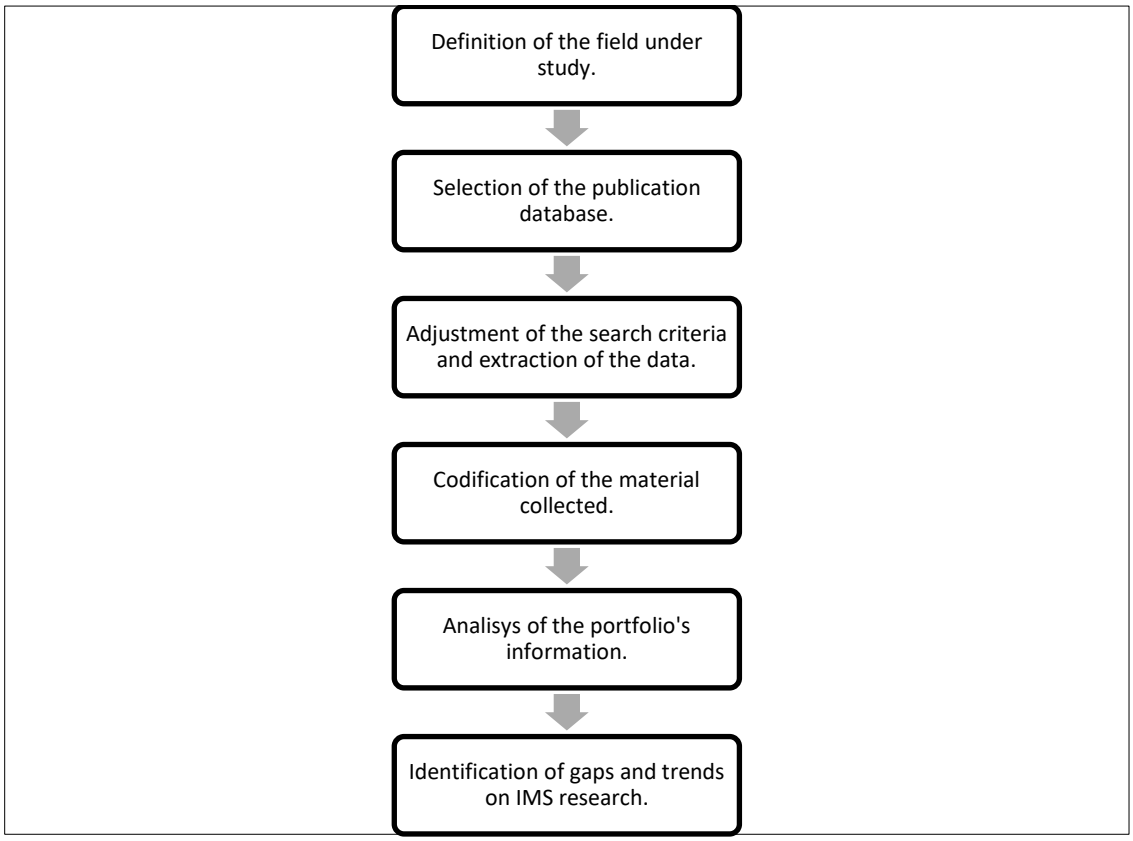
This paper is a bibliometric study in which we aim to investigate core themes, gaps and trends in the IMS research area. The bibliometric study is a measurement of the impact of scientific publications that highlights a lack of subject headings and helps researchers and/or research users to identify articles that describe and explain specific synthesis methods (PERRIER et al., 2016).

Bibliometric methods have been applied in various forms for a century or more. Nevertheless, over the last years the importance of bibliometrics has increased due the constant scenario of continuous updating in which researchers work. This bibliometric analysis followed five steps, as shown in Figure 14.

The strategic search was based on the following query in the titles, keywords, or abstracts of the articles: “Integrated Management Systems”; “Management System Integration”; “IMS”; “ISO 9001” AND “ISO 14001”; “ISO 9001” AND “OHSAS 18001”, and finally, “ISO 14001” AND “OHSAS 18001”.

It should be mentioned that in Scopus database there are various document types such as article, article in press, book, book chapter, conference paper, conference review, editorial, erratum, letter, note, review and short survey. As we only wanted to include scientific papers, the records of the following types were included: articles, articles in press, conference papers and review papers.

Figure 14 - Research methodology flow bibliometrics IMS



Source: Nunhes and Oliveira (2018).

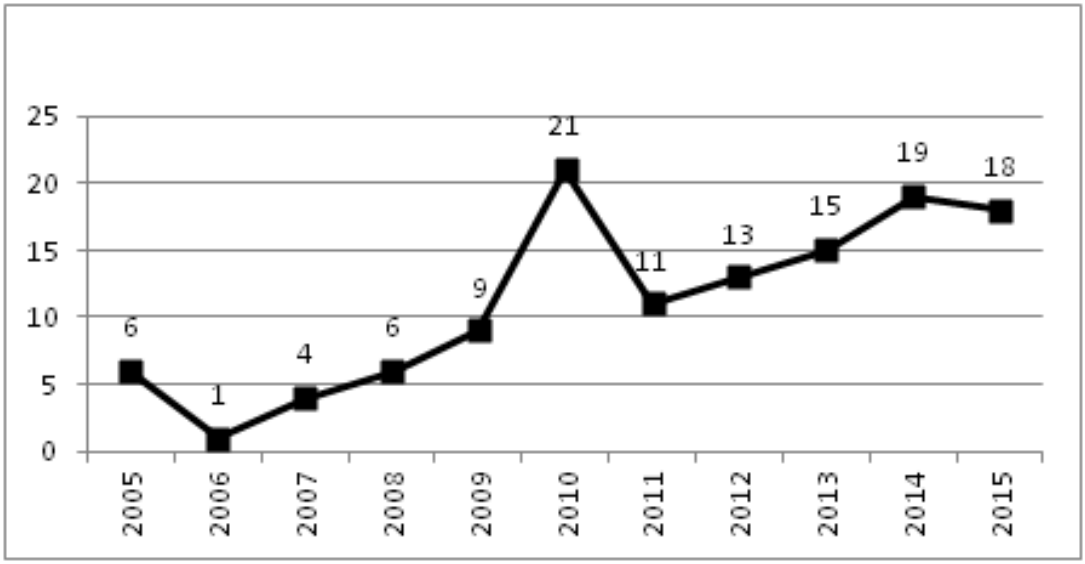
The results were refined by academic papers published from 2005 to 2015, but only using the latest articles to identify gaps and trends for future researches, as they probably would have not been filled yet. The data extraction phase was conducted in July 2016, and resulted in 123 relevant articles.

After extracting the articles to compose the IMS portfolio's, the encoding process was performed to codify the material collected. The portfolio data was encoded on several variables, such as language, type and field of research, most eminent authors and journals, year of publication, countries with highest productivity, among others. Finally, the bibliometric analysis of portfolio’s information was carried out with the support of the computational tools Microsoft Excel and VOSviewer version 1.6.4. The last tool was used specifically for creating maps based on network data.

3.4 RESULTS AND DISCUSSIONS

The 123 articles of the IMS portfolio were published in 9 languages, and 87% of the articles were published in English for wider dissemination. The non-English publications were published in Portuguese (7), Romanian (6), German (2), Spanish (2), Croatian (1), French (1), Italian (1) and Lithuanian (1), accounting for 17% of the total journal publications. Over the last ten years, the publication pattern on IMS field increased. Figure 15 shows the distribution of the articles published from 2005 to 2015 by year.

Figure 15 - Article distribution by year of publication



Source: Nunhes and Oliveira (2018).

Observe in Figure 15 that by 2009 there was a lower growth in the production. After that, in 2010, a tremendous increase in the number of publications was verified, reaching a growth rate of approximately 135%. The publication rate began to increase considerably after 2008, probably under the influence of the publication of the ISO handbook titled ‘‘The Integrate87d Use of Management System Standards” in July 2008.

Following this trend, a further increase in the number of articles on IMS field can be predictable from this year due the recent publication of ISO Annex SL by ISO, in September 2015. It should also be highlighted the majority of the articles analyzed (98, 80%) were published in the last 6 years. Table 11 shows the distribution of articles in the journals.

Table 11 - Article distribution by journal

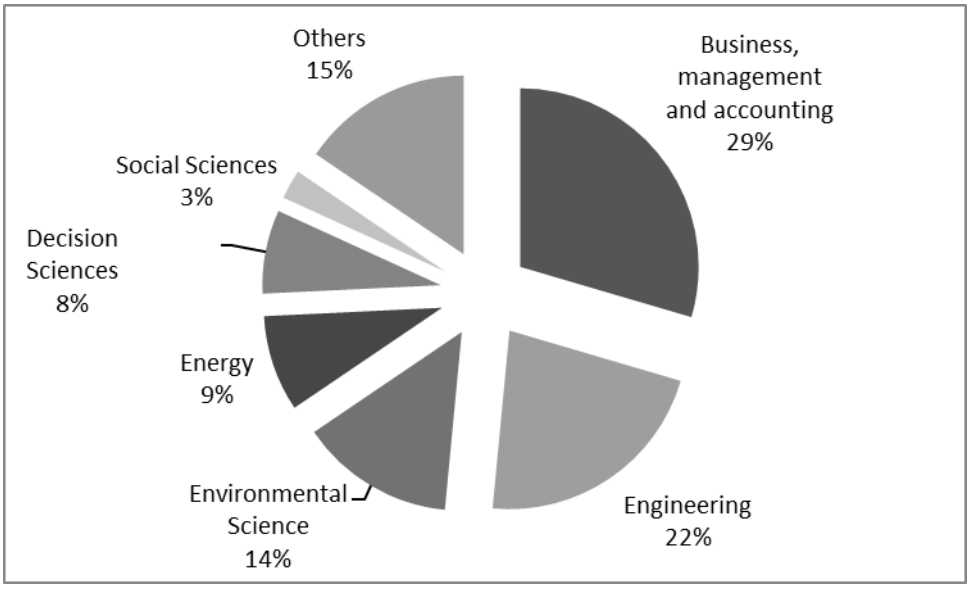
JOURNAL	ISSN	NUMBER OF ARTICLES	IMPACT FACTOR (SCOPUS 2015)	PERCENTAGE OF SAMPLE
Journal of Cleaner Production	0959-6526	21	5.048	17%
TQM Journal	1754-2731	12	0.992	10%
Total Quality Management and Business Excellence	1478-3371	9	1.512	7%
Quality - Access to Success	1582-2559	9	0.393	7%
International Journal of Quality and Reliability Management	0265-671x	5	1.053	4%
Management of Environmental Quality	1477-7835	3	0.556	2%
Journal of Food, Agriculture and Environment	1459-0263	3	0.271	2%
Gestão e Produção	0104-530x	3	0.376	2%
Produção	0103-6513	3	0.251	2%
Engineering Economics	1392-2785	2	0.963	2%
Safety Science	0925-7535	2	2.258	2%
Industrial Management and Data Systems	0263-5577	2	1.624	2%
Metalurgia International	1582-2214	2	0.061	2%
Subtotal	-	76	-	62%
Others	-	47	-	38%
Total (Subtotal+Others)	-	123	-	100%

Source: Nunhes and Oliveira (2018).

The portfolio contains 123 articles published in 60 journals. Journal of Cleaner Production ranks first both in the number of publications (21, 17%) and Impact Factor (4.96), followed by TQM Journal (12, 10%) and Total Quality Management and Business Excellence (9, 7%). It was also observed that the most journals on IMS have focus on research subjects to production and quality. Besides this, Journal of Cleaner Production and Safety Science have focus on sustainability and human and industrial safety, respectively.

This set of information can provide important submission information for new researchers. The arrangement of IMS articles by subject area is shown in Figure 16. Note that the same article may be classified in more than one area, therefore the sum of the percentage results in more than 100%.

Figure 16 – IMS articles by subject area

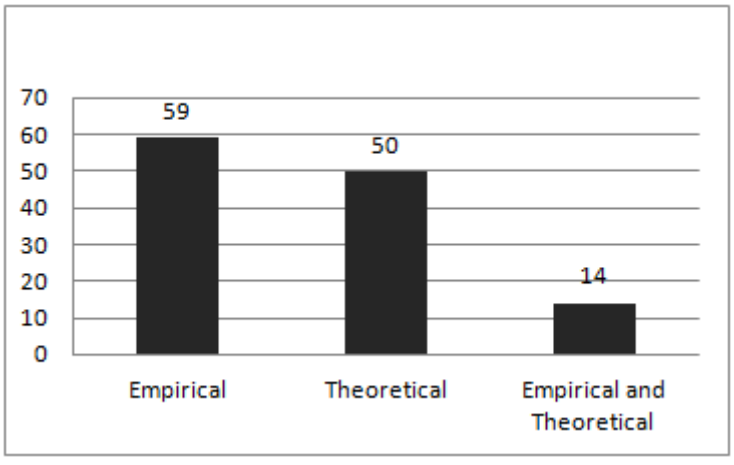


Source: Nunhes and Oliveira (2018).

The most articles were framed in the areas of “Business, management and accounting” (29%), “Engineering” (22%), “Environmental Science” (14%), “Energy” (9%), “Decision Sciences” (8%) and “Social Sciences” (3%). However, as IMS has a wide application, and can be studied in different areas and perspectives, other articles of different areas, such as “Computer science”, “Agriculture”, “Medicine”, among others, were found in 15% of the publications.

Of the analyzed articles, 59 were empirical studies, 50 theoretical and 14 were both practical and theoretical (Figure 17). The high number of empirical studies has presented important use in IMS theory building and verification.

Figure 17 - Types of research



Source: Nunhes and Oliveira (2018).

After classifying the types of research, the empirical studies were detail analyzed according to the research models and the methods used to collect and analyze data (Table 12). As can be seen in Table 10, the most empirical studies exhibited a qualitative perspective (27, 46%). Further, the most frequently used methods of data collection were surveys (21, 47%) and interviews (18, 31%). The data analysis method included case study (28, 47%), statistics models (20, 34%), multi-method (9, 15%) and descriptive statistics (2, 3%).

Table 12 - Classification and details of empirical studies

Classification	Details of the method used	# of occurences	% of occurences
Research approach	Qualitative	27	46%
	Quantitative	23	39%
	Qualitative and Quantitative	9	15%
Method	Case Study	28	47%
	Survey	21	36%
	Action Research	6	10%
	Multi-Source	4	7%

Source: Nunhes and Oliveira (2018).

Figure 18 - Keyword density cloud

Source: Nunhes and Oliveira (2018).

The search returned 307 keywords used by the authors in the portfolio Figure 18 reported some with greater repeatability in the articles. The keywords "integrated management system", "management system" and other correlated were excluded from the keyword density cloud because its inclusion would not enrich the analysis, once they are obvious keywords, contained in almost all the articles. “ISO 9001” was used 30 times and “quality management” and “ISO 14001” 29 times each. Observe that keywords related to OHSMS were used less often. “OHSAS 18001” and "occupational health and safety" appeared, respectively, 11 and 6 times. It shows that between 2005 and 2015 were developed more studies regarding the integration of QMS and EMS than studies with approaches to integration of OHSMS with other MSs.

Author keywords supply the main information of the articles and in this way, research trends can be obtained by analyzing these keywords. The keyword analysis of this study has indicated the emergence of a new trend of research on IMS. In this sense, it was noted that besides the traditional variations of keywords related to quality, environment, safety and their certifiable MSs, terms as "sustainability" and "sustainable development" have received more attention on IMS field recently, having been mentioned among the author keywords 11 times in total. Table 13 ranks the 10 countries with the greater productivity on IMS.

Table 13 - Top 10 countries IMS

RANK	COUNTRY	NUMBER OF ARTICLES (A)	PERCENTAGE OF SAMPLE	TOTAL OF CITATIONS (B)	PRODUCTIVITY RATE (B/A)	H-INDEX
1	Spain	25	20%	366	14,6	2
2	Canada	21	17%	355	16,9	1
3	Brazil	10	8%	54	5,4	0
4	Romania	10	8%	2	0,2	0
5	UK	9	7%	71	7,9	0
6	China	7	6%	127	18,1	0
7	USA	6	5%	117	19,5	0
8	Italy	6	5%	98	16,3	0
9	Portugal	6	5%	96	16	2
10	Australia	6	5%	36	6	1

Source: Nunhes and Oliveira (2018).

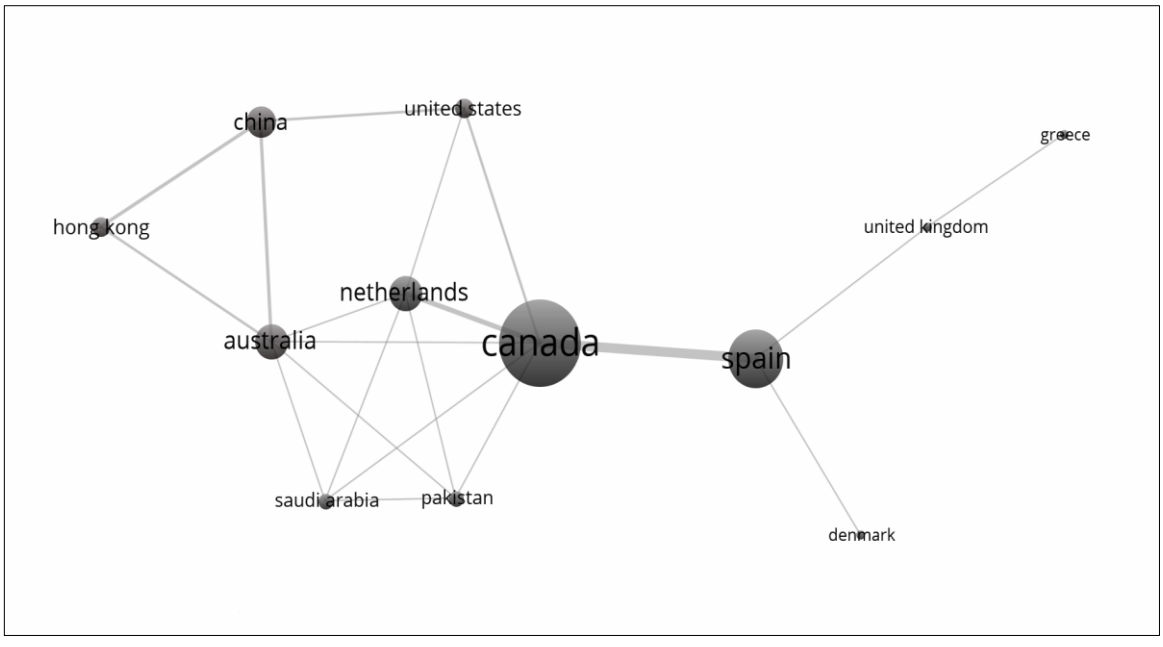
This analysis contemplated the number of published articles by country, the total number of citations they received, the average citations per article as well as the h-index, which measures the quality of research output building on the number of citations received. For this specific purpose, the h-index is the number of articles within a given country that received at least h citations.

According to Table 13, of 40 published countries or territories, Spain led the productivity ranking in the period between 2005 and 2015, with the most quantity of published articles (25, 20%), the larger amount of citations (366 citations) and the highest h-index. Following, Canada and Brazil appeared as the second and third in number of publications with 21 and 10 articles published that represent 17% and 8% of the portfolio, respectively.

Regardless of Romania ranks fourth in the list of the top 10 countries, it should be highlighted that this country presented the lowest productivity rate, only 0.2. In contrast, USA has the best productivity rate (19,5) and ranks seventh. Despite producing few articles, it was observed that articles published in USA have a high quality, which is a reflection of the expressive number of citations received (117 citations). Together, the top 10 countries make up 82% of articles published (106 articles).

The analysis of the collaboration network for the countries or territories, presented in Figure 19, was performed to identify the structure of synergies on the development of studies on IMS across the world.

Figure 19 - Network of countries/territories



Source: Nunhes and Oliveira (2018).

The size of circles represents the amount of co-authorships and the distance between two circles is inversely proportional to the collaboration between individual countries, i.e., shorter distances suggest more collaboration.

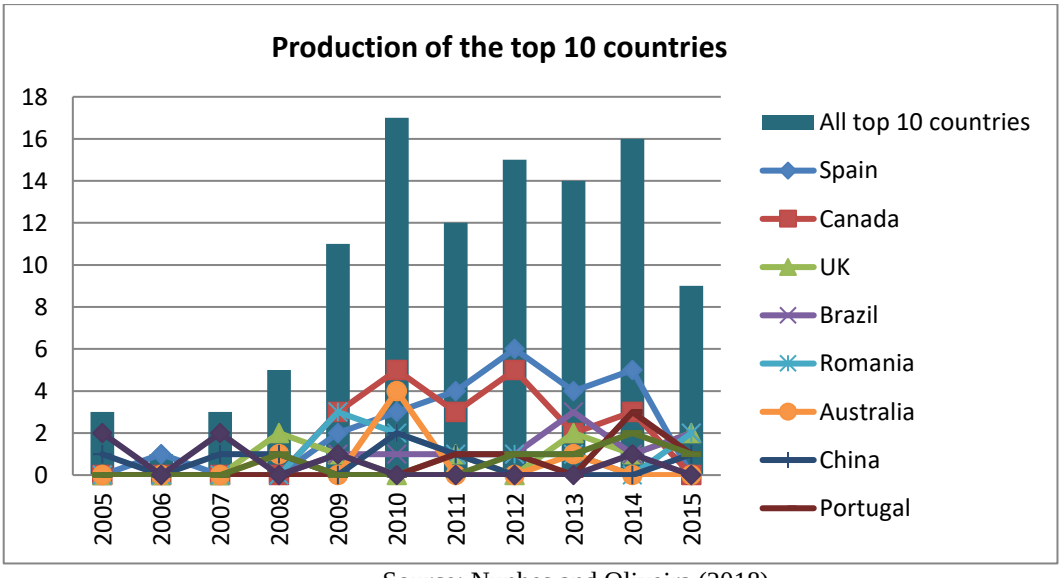
Note in Figure 19 that Spain and Canada, the first and second most productive countries, respectively, stands out among the others with a stronger cooperation relationship. In addition, Canada and Australia are the countries that have the largest collaboration networks, though the relationship among Australia's collaboration network is weaker than those of Canada.

As the sixth in the ranking of top 10 countries, China has collaborated with USA, Australia and Hong Kong. A cooperation network of British collaborators with Spanish and Greek was also observed.

With regard to cooperation, Chang and Huang (2013) emphasize that is universally known that exchanges in scientific research are important. Thus, although interactions have been verified among 12 countries, more international cooperation and exchanges are needed, especially in Brazil, Romania, Italy, Portugal and others countries that have produced enough articles but do not have yet an international collaboration network.

Moreover, it can be noted that many countries which have created their own models of MSs integration, such as Australia (AS/NZS 4581:1999), Denmark (DS 8001:2005), Spain (UNE 66177:2005) and England (PAS99:2006) have presented important contributions to IMS research in terms of production and collaboration network. The production of the most productive countries per year is shown in Figure 20.

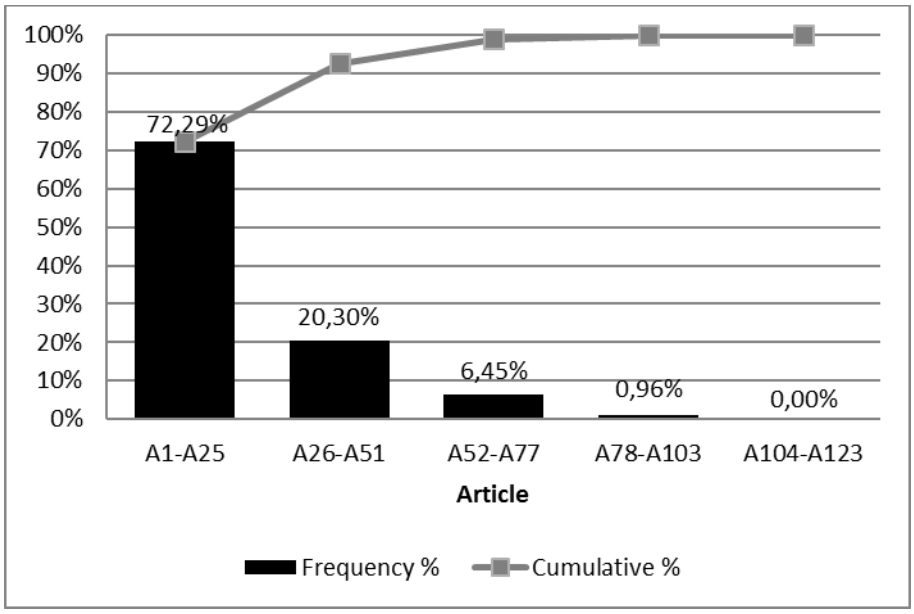
Figure 20 - Articles published per year by top 10 countries



Source: Nunhes and Oliveira (2018).

A correlation between the number of publications and the publication year was observed in most countries (Figure 20), resulting in low production from 2005 to 2008, general increase from 2009 to 2014 and decrease of 44% in 2015, compared to the previous year. It shows that the production of these top 10 countries have followed the same trend of annual production shown in Figure 20 of this study. Figure 21 shows the citation analysis. The articles were sorted in descending order of citations and, after that, were split into 5 groups. Observe that the distribution of citations roughly follows the Pareto's principle, also known as the 80-20 rule, where only a small share of articles gathers the majority of the citations.

Figure 21 - Pareto chart of citations by article



Source: Nunhes and Oliveira (2018).

The citation landscape shown in Figure 21 was built mainly by 25 articles (A1-A25, 20%) that account for more than 72% of all citations. The other three groups, which represent 99 articles (A26-A103, 80%), added up together only about 28% of citations. Moreover, the analysis of the 2 last groups showed that 25% of articles (31 publications) had no citation and 11% (13 publications) had only one. This might suggest that these works are of poor quality or that the topics studied are little interesting to the research community. However, this conclusion cannot be generalized once that 14 of the articles that had one or none citation are newly published papers (published in 2015).

Given the relevance of some articles to IMS research, the most cited papers were analyzed. The characterization of the 10 most cited articles on IMS was based on information available in the Scopus database in July 2016 and is presented in Table 14. In addition to

considering the absolute number of citations and the evolution of citations over the years, the average annual number of citations to a given article since its publication year until 2016 was calculated. The last metric has been used in many bibliometric studies to normalize the effect of publication year (age) on the total numbers of citations (GAROUSI; MÄNTYLÄ, 2016).

The analysis of Table 14 indicates that the six most cited articles were published in "Journal of Cleaner Production", journal previously classified in this bibliometric study as the most influent journal on IMS field. One article was published in "TQM Journal" and another in "Safety Science", the second and eleventh most influent journals, respectively. Despite of the "Corporate Social Responsibility and Environmental Management journal" and "Managerial Auditing Journal" published articles that are among the most cited, these journals do not stand out in terms of impact factor and production to the IMS field, as reported in Table 14.

Table 14 also describes the evolution in the number of citations over the years. The period 2010-2015 was proved to have the highest number of citations. Further, 6 of the 10 most cited articles were published between 2008 and 2015 (the most productive period, according to Figure 1). It shows that there is not a strong correlation between articles published during the high productivity period with the citation quantity received.

Observe that Bernardo et al. (2009) is the first on the list, with the highest average citations (11.28), followed by Salomone (2008) and Jørgensen et al. (2006), with the average citation of 11 and 10.4, respectively. If the absolute number of citations were considered, Jørgensen et al. (2006) would be the first on the list, followed by Zeng et al. (2007) and Salomone (2008), with 92 and 88 absolute citations, respectively. It is also worth highlighting that most of the top articles carried out empirical studies (8 surveys and 1 case study).

By selecting the most cited papers, we can identify the subjects of IMS field that have had a greater impact on the academic universe. Note that the top 10 articles together account for almost half of the citations (642 citations, 44%), which means that they have contributed significantly to development of IMS research. The relevance of the most cited articles enables us to identify the hottest topics of IMS from 2005 to 2015.

Table 14 - 10 most cited articles on IMS

Rank	Most cited articles	Author(s)/Year	Research Method	Journal/ISSN	Times cited	Average Citations	Evolution of citations (2005 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016)
1	How integrated are environmental, quality and other standardized management systems? An empirical study	Bernardo et al. (2009)	Survey	Journal of Cleaner Production/0959-6526	79	11.28	0 8 7 15 14 19 12 4
2	Integrated management systems: experiences in Italian organizations	Salomone (2008)	Survey	Journal of Cleaner Production/0959-6526	88	11	1 4 12 8 15 16 17 12 3
3	Integrated management systems – three different levels of integration	Jørgensen et al. (2006)	Literature Review	Journal of Cleaner Production/0959-6526	104	10.4	1 4 8 16 12 12 16 16 16 3
4	A synergetic model for implementing an integrated management system: an empirical study in China	Zeng et al. (2007)	Survey	Journal of Cleaner Production/0959-6526	92	10.22	1 1 7 15 6 12 12 20 17 1
5	Implementing environmental with other standardized management systems: Scope, sequence, time and integration	Karapetrovik and Casadesús (2009)	Survey	Journal of Cleaner Production/0959-6526	66	9.42	1 7 6 14 8 16 11 3
6	Towards more sustainable management systems: through life cycle management and integration	Jørgensen (2008)	Case Study	Journal of Cleaner Production/0959-6526	59	7.37	1 3 10 3 9 9 14 9 1
7	Integration of quality management and environmental management systems similarities and the role of the EFQM model	Tarí and Molina-Azorín (2010)	Survey	TQM Journal/1754-2731	34	5.67	2 9 6 10 6 1
8	Towards occupational health and safety systems in the construction industry of China	Zeng et al. (2008)	Survey	Safety Science/0925-7535	40	5	4 7 7 7 8 5 2
9	Integrated management systems as a corporate response to sustainable development	Oskarsson and Von Malmborg (2005)	Survey	Corporate Social Responsibility and Environmental Management/ 1535-3966	40	3.63	1 1 1 2 3 7 1 6 5 4 8 1
10	Implementing integration of ISO 9001 and ISO 14001 for construction	Zeng et al. (2005)	Survey	Managerial Auditing Journal/0268-6902	40	3.63	3 2 3 4 5 9 4 7 1 2

Source: Nunhes and Oliveira (2018).

Looking at the content of the most cited publications we identified 5 topics that were most approached by academic community in the period analyzed. They are the following: 1) IMS levels of integration, 2) Major motivations, benefits and obstacles to operate multiple MSs, 3) Models to implementation of IMS and 4) IMS to sustainability. Table 15 shows the most cited articles sorted accordingly with the topics approached.

Table 15 - Topics approached by top 10 articles

LINE OF RESEARCH	AUTHOR(S)/YEAR
IMS levels of integration	Jørgensen et al. (2006); Bernardo et al. (2009)
Major motivations, benefits and obstacles to operate multiple management systems	Zeng et al. (2005); Zeng et al. (2007); Salomone (2008); Tarí and Molina-Azorin (2010); Zeng et al. (2008);
Models to implementation of IMS	Zeng et al. (2007); Tarí and Molina-Azorin (2010)
IMS to sustainability	Oskarsson and Von Malmborg (2005); Jorgensen et al. (2008)

Source: Nunhes and Oliveira (2018).

Bernardo et al. (2009) and Jørgensen et al. (2006), the first and third most cited articles respectively, discussed about IMS levels of integration. Jørgensen et al. (2006) presented a theoretical contribution, in which described three ambition levels of integration characterized by "correspondence", "coordinated" and "strategic" levels. Three years after this theoretical contribution, Bernardo et al. (2009) performed an empirical study on 435 companies certified by multiple MS standards, including ISO 14001: 2004 and ISO 9001: 2000 at the minimum. The findings were quite aligned with the theoretical classification of the integration degrees proposed by Jorgensen et al. (2006) and others (see also SEGHEZZI, 1997; KIRKBY, 2002), which highlights the existence of three different levels of integration.

Five of the most cited articles investigated motivations, benefits and obstacles of IMS implementation using literature and results from empirical studies. This topic was widely explored from 2005 to 2015 (see also works of SANTOS ET AL., 2011; OLIVEIRA, 2013; ABAD ET AL., 2014; BERNARDO ET AL., 2015). In addition to empirically investigate the major integration obstacles, Zeng et al. (2007) proposed a multi-level synergic model to help ensure continuous improvement of the organization and management systems, Tarí and Molina-azorín (2010), in turn, presented the European Foundation for Quality Management (EFQM) model as a basis to develop an IMS.

Regarding IMS to sustainability, Oskarsson, Malmborg and Von (2005) discussed both from a theoretical and practical point of view whether IMSs can support the companies in their management of sustainability. As a result, the authors concluded that act proactively and do more than legal demands or demands in the standards are needed to achieve sustainable development within the companies.

Corroborating, Jørgensen (2008) emphasizes that in order to contribute to a sustainable development the IMS has to be expanded throughout the organization, including the whole product chain and all the stakeholders, which according to the authors corresponds to a similar focus in CSR. In this sense, it should be highlighted that Salomone (2008), Jørgensen et al. (2006) and Karapetrovic and Casadesús (2009) contemplated in their empirical studies companies certified not only by ISO 9001, ISO 14001 and OHSAS 18001, but also companies certified by Social Accountability 8000 (SA 8000), which is a standard with social and ethical issues in focus.

Table 16 presents an analysis of the most cited authors on the IMS field. The authors were ranked according to the average number of citations, which is given by calculating the total number of citations by the number of publications. This metric was chosen over the absolute number of citations because it normalizes the effect of the number of publications on the number of citations.

Despite Tine Herreborg Jørgensen and Jonathan Jingsheng Shi are the first and second authors with the highest average number of citations, observe in Table 16 that both published only two articles on IMS field from 2005 to 2015. In contrast, Stanislav Karapetrovic and Martí Casadesús were the authors with the highest h-index (20) and number of publications in the period, with 14 and 12 articles published, respectively.

Further, it was noted that seven most cited authors have operated in countries that presented high productivity rates (Spain and Canada, the first and second most productive countries, and China and USA, the sixth and seventh in the ranking, as shown in Table 16. This bibliometric study has also revealed that studies on IMS are interdisciplinary, that is, its application is extended in various fields. This setting can be observed in Table 17, which shows that IMS research have arousing the interest of scholars from economics, business management and engineering fields.

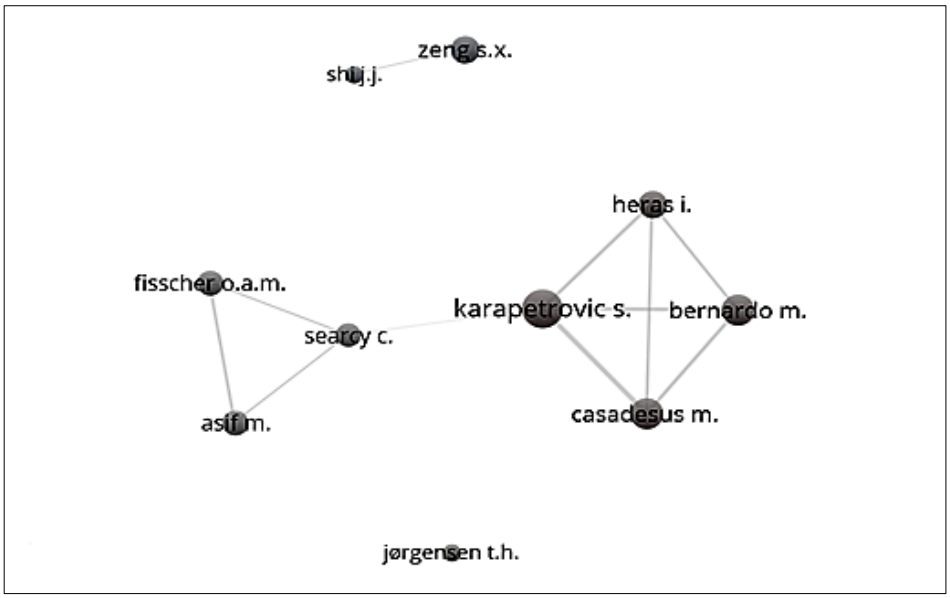
By analyzing the most cited keywords of the top 10 authors was possible identify that they have researched subtopics in common. This relationship can be better understood by visualizing the co-authorship network for the most cited authors, shown in Figure 22.

Table 16 - Top 10 authors IMS

Rank	Author	Institution/Country	# of articles on SM (a)	Times cited (b)	Average citations (a/b)	h-index	Evolution of citations <2005	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1	Asif, M.	Mohammad Ali Jinnah University, Islamabad, Pakistan	2	50	25	9	1	0	0	1	4	11	26	15	21	25	30	25	4
2	Ahmad, N.	National Textile University Faisalabad, Faisalabad, Pakistan	2	49	24.5	6	1	0	0	3	3	10	19	11	21	16	27	18	3
3	Glass, J.	Loughborough University, Department of Civil and Building Engineering, Loughborough, United Kingdom	2	49	24.5	11	1	0	0	3	3	10	24	20	32	27	44	36	6
4	Pagell, M.	University College Dublin, Dublin, Ireland	2	40	20	22	0	0	0	0	0	8	12	29	28	41	37	8	
5	Wiengarten, F.	Universitat Ramon Llull, ESADE Business School, Barcelona, Spain	2	40	20	11	0	0	0	0	0	1	15	18	49	45	79	70	15
6	Isaksson, R.	Uppsala Universitet, Department of Engineering Science, Uppsala, Sweden	2	39	19.5	4	0	0	0	0	0	0	8	12	32	33	52	44	11
7	Mazza, A.	Universita degli Studi del Sannio, Benevento, Italy	2	24	12	4	1	0	0	0	0	1	8	5	13	12	29	38	8
8	Garvare, R.	Lulea tekniska Universitet, Department of Business Administration, Lulea, Sweden	2	21	10.5	9	1	0	0	0	0	1	8	5	13	12	29	38	8
9	Kurdve, M.	Swerea IVF AB, Molndal, Sweden	2	19	9.5	3	0	0	0	0	0	1	15	18	49	48	88	80	20
10	Wiktorsson, M.	Malardalens hogskola, School of Innovation, Design and Engineering, Vasteras, Sweden	2	19	9.5	3	1	0	0	0	0	1	8	3	8	7	21	34	7

Source: Nunhes and Oliveira (2018).

Figure 22 - Co-authorship network of top 10 authors



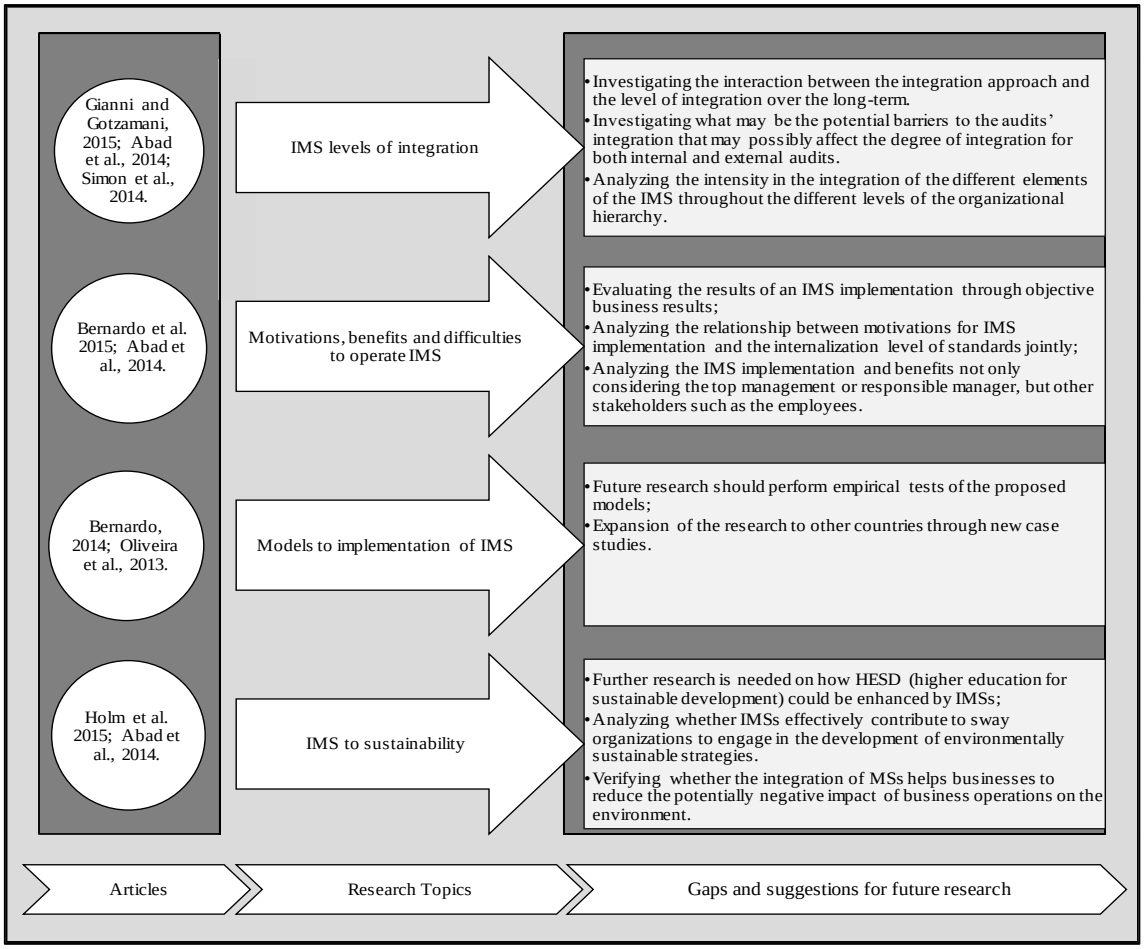
Source: Nunhes and Oliveira (2018).

Note in Figure 22 that the top 10 authors tended to cooperate between them, generating three clusters of authors. It was verified that Inaki Heras, Stanislav Karapetrovic, Merce Bernardo and Martí Casadesús formed a research group that have studied IMS focusing on integrated audits. Olaf Fisher, Cory Searcy and Muhammad Asif, in turn, have investigated together the implementation of IMSs from the perspective of stakeholders' requirements in order to building CSR into business initiatives. Further, Jonathan Jingsheng Shi and Saixing Zeng have evaluated the implementation of IMSs for construction companies. Jørgensen was the only one of the 10 most cited authors who did not have any co-authorship link.

Observe that the cooperation among authors from different countries and fields has resulted in the development of high impact researches', what subsequently, has made of them the top authors. In this sense, it should be highlighted that five top authors had participation in the development of, at least, one top article.

Finally, the gaps in the literature and trends for future research were analyzed considering the main lines of research previously identified in the analysis of the top 10 articles. Figure 23 shows the gaps and suggestions for future studies highlighted by researchers in the last 3 years of the analyzed period (2013-2015).

Figure 23 - Gaps and suggestions for future research



Source: Nunhes and Oliveira (2018).

As can be seen in Figure 23, the future researches in IMS tend to be focused on topics until then under-researched related to "IMS levels of integration", "Motivations, benefits and difficulties to operate IMS", "Models to implementation of IMS" and "IMS to sustainability".

Regarding "IMS levels of integration" is suggested to investigate the potential long-term impact of the adopted integration approaches to the top management commitment and the intervening variables (GIANNI; GOTZAMANI, 2015), studying barriers to the audits' integration that may possibly affect the degree of integration, such as the lack of specialized auditors or the differences in the elements of the standard (SIMON et al., 2014) and analyzing whether the intensity in the integration of the different elements of the IMS varies throughout the different levels of the organizational hierarchy (ABAD et al., 2014).

In order to explore deeply and improve the results obtained so far in respect to "IMS motivations, benefits and difficulties", Bernardo et al. (2015) suggested the evaluation of the results of an IMS implementation through objective business results and not only considering

the top management or responsible manager, but other stakeholders (such as employees). Corroborating, Abad et al. (2014) argued that for businesses have better criteria for deciding on the right level of integration in accordance with the benefits being sought, new processes to IMSs should accommodate both specific goals of the IMS and the business objectives.

Bernardo et al. (2015) also suggested analyzing the relationship between motivations for IMS implementation and the internalization level of standards jointly. According to the authors, the results could report that organizations decide to implement an IMS mainly for external reasons (improvement of organization's image) and the existent dichotomy of internal/external reasons for separate standards could also be applied for IMS. Thus, the relationship between these motivations and the internalization level and the performance could be also analyzed.

Further, studies that proposed models to implementation of IMS (see BERNARDO, 2014; OLIVEIRA, 2013) suggested performing empirical tests of the proposed models and its expansion to other countries. Bernardo's model analyzed, through the literature review, the relationship between integration of MSs and innovation management performance and Oliveira's model, based on the research, fusion and contraposition of theoretical concepts, proposed scientifically based guidelines for the integration of certifiable MSs and their customization to the manufacturing environment.

Finally, confirming the trend shown in the density keyword analysis, both Abad et al. (2014) and Holm et al. (2015) highlighted the need for better analyze whether and how IMSs can contribute to engage companies in the development of environmentally sustainable strategies. In addition, future studies should attempt to verify whether the integration of MSs helps businesses to reduce the potentially negative impact of business operations on the environment (HOLM; VUORISALO; SAMMALISTO, 2014). It is worth mentioning that a considerable share of studies has not contributed with suggestions for future research.

3.5 CONCLUSIONS

Integration of MSs is a topic that has been extensively discussed by academic community over the years. Based on the analysis of 123 publications available in the Scopus and Web of Science databases, the results showed an increased in the number of publications in the IMS domain over the analyzed period, especially from 2008 to 2014. Further, it was observed the literature on IMS was built in 40 countries/territories and published in 60 journals. Spain, Canada and Brazil were ranked as the top three countries, producing respectively, 20%, 17% and 8% of all pertinent publications. Nevertheless, the fact that a country has more publications

does not mean that they are of a higher quality. In this sense, it was observed that despite ranking seventh with few articles published; articles published in USA presented high quality due the expressive number of citations received (117 citations). Regarding the most productive journals, Journal of Cleaner Production ranked first in the list, followed by TQM Journal and Total Quality Management and Business Excellence.

An interesting finding is that the citation landscape was built mainly by 25 articles (20%) that account for more than 72% of all citations. Moreover, the keyword analysis indicated that "Sustainability" and "sustainable development" are terms emerging within the IMS context. The same trend of linking IMS with approaches to sustainable development was verified when we analyzed the content of two most cited publications. Other core themes investigated in the analyzed period were related to IMS levels of integration; major motivations, benefits and obstacles to maintain multiple parallel MSs; and models to implementation of IMS.

It is worth noting the fact that the high impact researches were produced with cooperation of authors from different countries and fields. In this sense, through this study the need for greater cooperation at international level and exchanges on IMS field was noted in order to foster the production of high-quality researches. Finally, this study highlighted the following opportunities for future research: (1) investigating levels of integration from a long-term perspective, (2) considering what barriers to the audits' integration that may possibly affect the degree of integration; (3) evaluating the results of an IMS implementation through objective business results, (4) performing empirical tests of the proposed models to implementation of IMS, and (5) better analyze whether and how IMSs can contribute to engage organizations in the development of environmentally sustainable strategies.

Throughout the study, we seek to get out of purely descriptive information in such a way as to privilege the analysis and its results. The main contribution of this paper is to characterize significant points about research on IMS, such as the subjects of IMS field that have had a greater impact on the academic universe, gaps and research trends in academic publications and most prominent countries and journals of field in order to assist the development of new studies.

4 RETHINKING THE WAY OF DOING BUSINESS: A REFRAME OF MANAGEMENT STRUCTURES FOR DEVELOPING CORPORATE SUSTAINABILITY

The article resulting from this step (NUNHES; BERNARDO; OLIVEIRA, 2020) was published in the “Sustainability” journal and is presented throughout this chapter.

4.1 INTRODUCTION

Achieving long-term sustainability is a challenge that requires urgent changes in the way business is done (BOCKEN et al., 2014). Companies are interdependent organizations embedded in a global systemic environment that calls for sustainable management of natural, social, and financial resources (ADAMS et al., 2016; JOYCE; PAQUIN, 2016). They are charged for most of the negative impact of economic growth and development because the “price” of extraction, use, and disposal of natural resources for the production of goods is quite significant and impacts not only nature but also society (BAUMGARTNER; EBNER, 2010b; MILNE; GRAY, 2013a).

Sustainable management has gained increased attention in the global scenario in light of the unbridled consumerism experienced since the Industrial Revolution when an economy unable to hold the society's economic progress emerged (ASIF; SEARCY, 2014; HOLTON; GLASS; PRICE, 2010). At first, corporate engagement with sustainable development was focused on understanding the meaning of sustainability and its possible implications for their businesses. Over time, a growing part of companies began to raise awareness not only about its meaning but also about the need to act effectively on it (MURA et al., 2018; UNEP-FI, 2016).

Indeed, companies have received increasing pressure to be greener from local laws, stakeholders, and final customers, and this has led them to find alternatives to implement sustainability in their operations (HOLTON; GLASS; PRICE, 2010; SAVINO; MAZZA, 2014). In 2019, more than 9500 companies in 160 countries signaled their interest in implementing sustainability and having it as an integral part of their business (UNITED NATIONS GLOBAL COMPACT, 2019).

Corporate sustainability (CS) or business sustainability (BS) is the concept of sustainable development applied to the reality of companies (ROCA; SEARCY, 2012). Whilst sustainable development provides a general view of sustainability, CS has a more suitable and applicable meaning for sustainability in the field of business, management, and operations (ASIF; SEARCY, 2014; SIEW, 2015). CS focuses equally on environmental, social and economic

performance, which is often operationalized through the TBL (MOLDAVSKA; WELO, 2017). The social, economic and environmental dimensions of the TBL are the core of the mainstream sustainability thinking (ADAMS, 2006; STEURER; LANGER, 2005).

The literature on CS emerged over the 1990s (ASIF; SEARCY, 2014; SALZMANN; IONESCU-SOMERS; STEGER, 2005) and, since then, various terms and definitions have been employed to address this subject; for instance, the definition of sustainable development of the Brundtland report and other CS-related terms such as the abovementioned TBL and BS; the business case for sustainability; environmental and social governance; corporate social commitment; and corporate environmental commitment (FEIL; DE QUEVEDO; SCHREIBER, 2017; GAO; BANSAL, 2013; LOZANO, 2015; SIEW, 2015).

This diversity found in the literature on CS is based on the elaboration of various types of tools and frameworks for CS development. CS deals with the balanced development of economic, environmental and social areas, but to the best of the authors' knowledge, there are no systematic reviews that focus on the joint analysis of aspects that make up the integrated management of these areas. Therefore, considering that the state-of-the-art in CS has gone through a period of intense development since the mid-2000s, it is the moment to gather these contributions to consistently advance the state-of-the-art in CS and discuss how to put them into practice (MONTIEL; DELGADO-CEBALLOS, 2014a).

Based on this, the research question posed in this study is "how can management structures be reframed in order to develop corporate sustainability?" The main objective of the paper is to systematize, through a literature review using content analysis of the 30 most cited articles from 2007 to 2017, the guiding pillars of CS management.

It is expected that this study will identify the management pillars of CS and discuss how they can be developed in order to promote more sustainable businesses. In this study, the pillars are macro elements of management reinterpreted in order to support the integration of CS in companies.

The novelty of the paper is to gather the knowledge created in a framework that can be used as a basis for further studies. This is especially important when a field advances significantly, as in the case of CS. Therefore, the main contribution of this paper is to systematize the generated knowledge (the key elements of the literature, such as the management aspects of CS, the benefits and barriers of implementation) in order to foster future investigations to consistently advance the state-of-the-art in CS. In turn, it contributes towards the dialogue and development of the CS field, especially for management purposes.

The paper begins by first providing an overview of the main aspects of CS management and some information that has inspired the development of this study. This is followed by a discussion of the adopted methodology in Section 4.3. The results are presented and discussed in Section 4.4, and, finally, Section 4.5 provides a summary of findings, concluding remarks, and future research lines.

4.2 THEORETICAL BACKGROUND ON CORPORATE SUSTAINABILITY MANAGEMENT

CS is a strategy of decision-making based on various levels of analysis of social, economic, and environmental issues that act as drivers for aligning a company's business model with its business strategy (LLORET, 2016; MOLDAVSKA; WELO, 2017). CS aims to meet the needs of internal stakeholders (employees, shareholders, and managers) and external stakeholders (e.g., customers, suppliers, society, government) without compromising the ability to serve them in the future (ASIF; SEARCY, 2014; ROCA; SEARCY, 2012).

The understanding of CS from the TBL perspective was coined in 1990 and popularized by Elkington (1997). It considers environmental, social, and economic aspects having the same value in decision making (HAMMER; PIVO, 2017). By using the TBL, companies can be oriented towards sustainable management, thus including concern with profit, people, and the planet in their culture, strategies, and operations (ASIF; SEARCY, 2014; GIMENEZ; SIERRA; RODON, 2012).

From a holistic perspective, (LOZANO, 2015) examined factors that promote the adoption of sustainable business practices. The results indicated that the drivers for sustainability in corporations can be internal (related to issues inside the organization) and external (related to stakeholders). Leadership and the business case were found to be the most important internal drivers, and reputation, customer demands/expectations, and regulation/legislation, the external ones.

The adoption of sustainability strategies is attractive from the business point of view, and the results of its implementation, can be pollution prevention, reduction of harmful emissions, and waste minimization; cost reduction resulting from progress on eco-efficiency issues and product innovation; better relationships with regulators and other stakeholders through legal compliance and retention of customers that recognize environmental values; and a contribution to fulfilling social needs, among others (EPSTEIN; ROY, 2001; KURDVE et al., 2015; SZÉKELY; KNIRSCH, 2005).

The search for obtaining such benefits from a more sustainable performance encompasses risk management and planning from a long-term perspective (NAWAZ; KOÇ, 2019; SZÉKELY; KNIRSCH, 2005). Despite this, there are various barriers and challenges that need to be overcome in order to achieve success with CS practices in the long run (HOLTON; GLASS; PRICE, 2010; SZÉKELY; KNIRSCH, 2005). For example, many companies have failed in planning for short-term horizons, thus blocking potential perspectives for long-term changes (HOLTON; GLASS; PRICE, 2010; SZÉKELY; KNIRSCH, 2005). Further, CS implementation demands a corporate redesign in terms of organizational strategy, objectives and vision that, at first, may not be financially convenient (GONZALEZ-PEREZ; LEONARD, 2015).

The focus in initiatives restricted to high-level management, not assuring the commitment of management in making necessary changes throughout their organizational systems, is another critical barrier to implementation (SZÉKELY; KNIRSCH, 2005). (HAHN et al., 2015) warns about the challenge of managing sustainability trade-offs, which may involve, for example, tensions between short-term corporate orientation versus long-term orientation, the adoption of structural and technological changes versus maintenance of existing practices, and the institution of personal versus organizational sustainability agendas.

Adopting sustainability within a company goes beyond a mere marketing work (SZÉKELY; KNIRSCH, 2005). It requires the development of organizational commitment, capacity for identification and management of risks and review, and the dissemination of the results achieved to gain stakeholder confidence (HOLTON; GLASS; PRICE, 2010). Companies engaged with sustainability present an organizational culture focused on sustainability; top management support; stakeholder involvement; environmental training; monitoring of supplier sustainability issues; business evaluation of non-financial parameters, such as quality, internal, and external reputation; and a high degree of commitment to stakeholders (ECCLES; IOANNOU; SERAFEIM, 2014; LINNENLUECKE; GRIFFITHS, 2010).

CS is implemented in making use of skills and instruments that introduce and develop a sense of collaboration and innovation for sustainability at a level that transcends the limits of a company's direct control (GIMENEZ; SIERRA; RODON, 2012; MOLDAVSKA; WELO, 2017). For instance, some skills needed are the ability to identify where and how to implement changes and the flexibility for changing behaviors through training rather than simply enhancing technical skills (HOLTON; GLASS; PRICE, 2010). With regard to the use of instruments for managing internal and external aspects of the TBL, one can highlight, for

example, the ISO 14001 EMS (HOLTON; GLASS; PRICE, 2010), the ISO 26000 CSR guidelines (HAHN, 2012), GRI and other CS guidance documents (HOLTON; GLASS; PRICE, 2010), and frameworks for identifying, implementing, and controlling sustainability aspects based on a TBL integrated view (BAUMGARTNER, 2014).

MS standards and/or guidelines are tools for managing various issues of the social, environmental, and economic pillars of sustainability, such as quality management, corporate governance structures, human capital management, stakeholder relations, environmental protection, and CSR (ENGERT; RAUTER; BAUMGARTNER, 2016; NUNHES; BERNARDO; OLIVEIRA, 2019). Amongst these standards are ISO 9001 (economic dimension) (SIEW, 2015; STEURER; LANGER, 2005), the ISO 1400 series and EMAS (environmental dimension) (GRIMM; HOFSTETTER; SARKIS, 2016; PETROS SEBHATU; ENQUIST, 2007; SIEW, 2015), and ISO 26000, SA8000, OHSAS 18,001 and AA1000 (social dimension) (ASIF; SEARCY, 2014; GRIMM; HOFSTETTER; SARKIS, 2016; SIEW, 2015).

Although a number of standards related to the management of the three dimensions of sustainable development exist (like those mentioned above) in a compartmentalized form (LOZANO; HUISINGH, 2011), there is still a need for developing a specific standard for implementing sustainability that integrates the environmental, social and economic criteria (ASIF et al., 2009). The GRI has contributed in this sense and published a set of sustainability reporting standards; however, the focus is on reporting and not on managing CS (LOZANO, 2015; MILNE; GRAY, 2013a). This tool has been also used to measure sustainable performance.

Also, many other initiatives, indices, and standards have been developed worldwide to develop and report sustainability with greater consistency and transparency (SIEW, 2015), such as British Standard BS 8900-1 (guidance) and BS 8900-2 (requirements) for managing sustainable development, World Business Council for Sustainable Development (WBCSD), Sustainability Integrated Guidelines for Management (SIGMA Project), United Nations Global Compact (UNGC) (HOLTON; GLASS; PRICE, 2010; MILNE; GRAY, 2013a; SIEW, 2015), KLD, EIRIS and DJSI (MILNE; GRAY, 2013a; SIEW, 2015).

The measurement of sustainability performance in a business context is an important part of the process of developing sustainable practices (MURA et al., 2018). Although companies have made substantial efforts to measure elements of sustainability (SZÉKELY; KNIRSCH, 2005), this question is still not clear for many managers who have asked what they can do in order to improve sustainability performance (EPSTEIN; ROY, 2001).

The CS field is in constant development, and, according to the existing research [2,21], this field has been open to accepting discussions on its most varied aspects. As pointed out in the introduction section of this study, over the years, several definitions and interpretations regarding CS have emerged (MONTIEL; DELGADO-CEBALLOS, 2014a; NAWAZ; KOÇ, 2019), some with joint emphasis on the environmental and social pillars and others focused on only one of them (MONTIEL; DELGADO-CEBALLOS, 2014a).

A recurring confusion is made, for example, by differentiating the terms CS and CSR. Historically, CSR has mostly covered social sustainability issues (MONTIEL, 2008; VAN MARREWIJK, 2013); however, from the second half of the 2000s onwards, the boundaries of CSR have expanded and the term has become a synonym of CS, i.e., the balanced development of economic, social, and environmental responsibilities in companies (MONTIEL, 2008). However, to date, slightly different references are made to both terms, which often leads to uncertainty (BANSAL, 2005). Thus, in order not to create confusion, throughout this paper only the term "corporate sustainability" is used.

Despite the divergences, the vast majority of the approaches to advance CS research refers to the definition of sustainability provided in the Brundtland Report (1987) and/or encompasses the balanced and holistic management of the economic, social, and environmental pillars of TBL (ENGERT; RAUTER; BAUMGARTNER, 2016; WCED, 1987). The WCED's sustainability definition can be helpful to base organizational strategies to tackle environmental and social sustainability criteria (BAUMGARTNER; RAUTER, 2017). The TBL has attracted increasing numbers of users as it is a practical tool that uses simple and direct images and narratives to approach and develop the theoretical paradigm of sustainability in the corporate scenario (ISIL; HERNKE, 2017).

However, the fact that many studies have been based on these approaches does not leave them immune from criticism. The Brundtland Commission definition and the TBL are useful but do not get companies very far as the WCED's sustainability definition is perceived to be too vague and philosophical (BROMAN; ROBÈRT, 2015; MONTIEL; DELGADO-CEBALLOS, 2014a), and TBL implies difficulties in measuring non-financial impacts (ISIL; HERNKE, 2017).

Literature reviews are the main path to organize and consolidate the scientific knowledge generated in a given period of time. Over the past four years (2015–2018), the annual number of literature reviews on CS has doubled over previous years (Scopus 2018), which corroborates that researchers have sought to advance the topic by amalgamating and comparing existing

findings rather than just proposing new paths without looking at what has already been done. Table 17 shows the literature reviews in CS published between 2015 and 2018.

Table 17 - Literature reviews in CS published between 2015 and 2018

RESEARCH TOPIC	AUTHOR(S)/YEAR
Corporate sustainability performance	Büyüközkan and Karabulut (2018); Grewatsch and Kleindienst (2017); Kühnen and Hahn (2018); Morioka, Bolis and Carvalho (2018); Pádua and Jabbour (2015); Saratun (2016)
Corporate sustainability and strategic management	Aui et al. (2017); De Stefano; Bagdali; Camuffo (2018); Engert, Rauter and Baumgartner (2016)
Sustainable business models	Lüdeke-Freund et al. (2018); Morioka, Bolis and Carvalho (2018)
Corporate sustainability reporting	Chandan (2015); Gonzalez-Perez and Leonard (2015); Siew (2015); Zsóka and Vajkal (2018)
Corporate sustainability frameworks, tools, and practices	Brones, Carvalho and Zancul (2017); Caldera, Desha and Dawes (2018); Goyal, Rahman and Kazmi (2015); Martinez (2015); Muñoz-Torres et al. (2018); Naomi et al. (2016); Seele (2017); Siano et al. (2015, 2016); Vildåsen, Keitsch and Fet (2017)
Sustainable supply chain	Fritiz, Schöggl; Baumgartner (2017)
Environmental corporate sustainability	Kang and Lee (2016); Yutu et al. (2016)
Adopting corporate sustainability in specific countries/regions	Bai, Sarkis and Dou (2015); El-Khalil and El-Kassar (2018)

Source: Nunhes, Bernardo and Oliveira (2020).

Table 17 presents the literature reviews in CS grouped in seven key areas of research. These literature reviews are fundamentally important to advance the state-of-the-art in CS; however, they have a specific focus on certain areas of CS research. It can be seen, therefore, that until the moment of the development of this study, no literature reviews have been published as the one proposed on this paper which aims to systematize the guiding pillars for the management of CS.

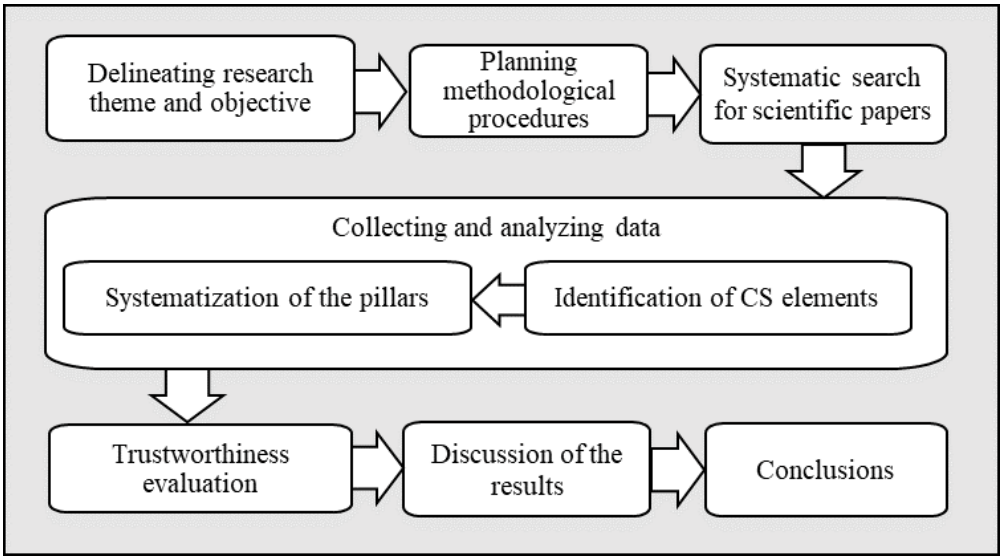
4.3 RESEARCH METHOD

In this section, the step-by-step of the development of the study is described following the research flow presented in Figure 24.

– Delineating Research Theme and Objective:

The planning stage consisted of defining the research theme and objective, which are essential elements to initiate the development of any study. The assessment of the current state-of-the-art in CS before defining the theme and objective of the paper was an important step that allowed us to identify the relevance of developing this research (see Table 15); the review allowed us to define the theme and objectives in order to fill the gap identified. The literature review conducted specifically to identify the research gaps that justify this study included articles published in the last three years (2015–2018) in relevant English-speaking peer-reviewed scientific journals.

Figure 24 - Methodological flow CS Pillars



Source: Nunhes, Bernardo and Oliveira (2020).

The articles that were used to support the novelty of this study were specifically those presented in Table 17 (Section 4.2) because they are recently published review articles in CS that have different purposes from this study. Therefore, the novelty of this paper is characterized considering the relevance of theme under investigation and that up to now, no study presenting an analysis of the literature, as proposed in this paper, was identified. The discussions about the scientific importance of this work can be found in the previous sections.

Based on this assessment of the state-of-the-art in CS, the need to systematize the generated knowledge in the field of CS in order to assist new investigations and consistently advance the state-of-the-art in CS was identified. Thus, the main objective of the paper is

defined as to systematize, through a literature review using content analysis of the 30 most cited articles from 2007 to 2017, the guiding pillars of CS management.

– Planning Methodological Procedures:

After defining the research theme and objective, we planned the methodological procedures to perform the study. It included defining the research method and the steps for its proper execution. Content analysis is a research method that aims to condense the volume of information collected, interpreting the results obtained, and verifying their reliability (BENGTSSON, 2016; SEURING; GOLD, 2012b). It can be used to analyze documents published in peer-reviewed journals, being, in this case, a powerful tool for developing literature reviews (MOLDAVSKA; WELO, 2017; WALLACE; FLEET; DOWNS, 2011; XIA et al., 2018). The content analysis may be descriptive or exploratory, which use deductive and inductive reasoning, respectively (BENGTSSON, 2016; SEURING; GOLD, 2012b).

Based on this, we developed a theoretical study through an inductive content analysis of the literature. The content analysis method was chosen because it allowed us to reach the main objective of the study (systematizing CS management pillars), starting from a fragmented state-of-the-art. The inductive approach was the most appropriate for this work because the categories were created during the process of analyzing the data collected (SEURING; GOLD, 2012b).

The planning stage to perform the content analysis followed the recommendations of (BENGTSSON, 2016), which suggests, beyond the definition of the objective, the definition of the sample and the unit of analysis, the method of data collection, the method of data analysis, and study implications. Therefore, the objective of conducting the content analysis is introduced in this topic, the definition of the sample and the unit of analysis is presented in Section 4.2, the method of data collection is described in Section 4.3, the method of data analysis is presented in Section 4.4, and finally, the study implications are drawn in Section 4.5.

– Systematic Search for Scientific Papers:

In order to make the execution of the study feasible, the content analysis was performed with a sample of the 30 most-cited peer-reviewed scientific journal papers (Appendix A). This criterion aimed to select the articles that disseminated the most the knowledge in the literature on CS during the period analyzed, that is, that have supported several other studies that have significantly contributed to advance the state-of-the-art in this field.

Bengtsson (2016) points out that sample size may vary according to the objective to be achieved; despite this, it is common that qualitative studies have from 1 to 30 units of analysis. In this study, each article was considered as a unit of analysis (in total 30 units of analysis). Nevertheless, it is acknowledged that this is an unavoidable limitation of the study, which, however, does not compromise the results that were based on the articles that spread the most their contributions in the literature on CS.

The systematic search for papers was carried out on 14 March 2018 in two major research platforms: Scopus and Web of Science. These are the largest databases of peer-reviewed literature and have available titles that go through a rigorous review process that places them among the most reputed journal indexing services (AGHAEI CHADEGANI et al., 2013; OLIVEIRA et al., 2019). Scopus and Web of Science were chosen to conduct the search for scientific articles because they are interdisciplinary databases that cover all areas related to management and corporate sustainability. Further, both of them provide access to multiple databases, gathering articles from various journals, and increasing their visibility through the use of a metadata architecture that connects peer-reviewed research of high quality. The use of these platforms is particularly relevant for this study because they include the major publishers related to the CS field, for instance, Springer, Wiley Blackwell, Taylor & Francis, IEEE, American Physical Science, and Elsevier (OLIVEIRA et al., 2019).

The keywords used in the research platforms were “corporate sustainability” OR “business sustainability” to be found only in the titles. Other filters used were the period of publication (from 2007 to 2017—a 10-year period of significant development in the field), type of document (articles or reviews), and language (English). After applying these filters, we excluded duplicate articles (present in both Scopus and WOS) and articles that, according to the authors’ screening, were outside the scope of the study. Lastly, the search results were ranked in descending order of citation. The final list of 30 papers selected for analysis is presented in Appendix B.

– Collecting and Analyzing Data:

Elo et al. (2014) advises that data collection in inductive content analysis should be opened and performed in an unstructured way. Bengtsson (2016) corroborates and further suggests the codification of the data. Based on these recommendations and in line with the chosen method, the list of codes was generated deductively, that is, the elements identified in the articles (in this case, practices for CS development) were coded in the course of the process

through qualitative content analysis of the material. Therefore, the first purpose of the content analysis was the systematization of CS elements presented in the 30 most-cited articles. The initial screening of the texts was assisted by the coding software, MAXQDA 2018, through which the authors structured and analyzed their main insights, contributions, and conclusions. The authors then conducted an in-depth reading of the texts and identified the CS elements.

The notes resulting from this initial analysis went through several refinement rounds, in which the CS elements were gradually compared and assessed by the authors of the study in order to eliminate redundancies and assure reliable coding results. This dialogue between co-researchers to perform content analysis data was recommended, for instance, by Elo et al. (2014). Appendix C shows the final list of CS elements identified in the literature analyzed following the coding process previously described.

The second purpose of the content analysis was to group the related codes for the formation of the categories. The pillars presented in this paper are based on these categories. The accounting of the frequency of occurrence of the codes in each unit of the sample was the criterion adopted to support the systematization of the pillars, as recommended by (BENGTSSON, 2016; SCOTT, 2006; VAISMORADI; TURUNEN; BONDAS, 2013). Hence, the most frequent elements based on the articles analyzed led to the systematization of the groups, while the other not-so-frequent elements were clustered to them (SCOTT, 2006).

A group of elements that appeared in at least 30% of the articles was observed, while the others were much less frequent. This minimum frequency of 30% was considered for the classification of the most frequent elements. The counting of the frequency of elements is one of the most used methods to perform content analysis (NUNHES; BERNARDO; OLIVEIRA, 2019; SCOTT, 2006). This practice is recommended by several authors, for instance, (BENGTSSON, 2016; SCOTT, 2006; VAISMORADI; TURUNEN; BONDAS, 2013). However, these authors do not define a minimum frequency that should be used. Instead of this, they recommend that the frequency used as barrier should be defined taking into account the particularities of the content analysis itself; that is, it is the authors' decision to establish a limit that brings together a significant amount of elements that can serve as a basis for the grouping and systematization of principles. The frequency of occurrence of the coded elements in the articles can be found in Appendix C.

In order to allow the open extraction of categories totally based on the data collected, categorizing the data in previously defined themes was avoided. The segmentation toward the pillars was carried out from raw data, since there were no previous studies dealing with the phenomenon and because the state of state-of-art in CS management is fragmented

(MOLDAVSKA; WELO, 2017; NUNHES; BERNARDO; OLIVEIRA, 2019). The categories (pillars) were proposed from the material under examination (SEURING; GOLD, 2012b) and guided by the authors based on their experiences conducting content analysis and their expertise in the subject (CS). This approach is based on the systematic content analysis method (inductive).

The advantage of this is the inclusion of insights throughout the interpretation of the results, as envisioned when performing inductive content analysis (MOLDAVSKA; WELO, 2017). The categorization must generate internally homogeneous and externally heterogeneous categories (BENGTSSON, 2016). Therefore, in this study, no element was classified into two groups simultaneously. The grouping of CS elements was conducted in view of the management areas that could support their development.

– Trustworthiness Evaluation:

Trustworthiness in qualitative research is often difficult to demonstrate. However, the presented method was designed considering important aspects that contributed to the transparency and reproducibility of the study, such as the systematic selection of the articles and the description of the main stages step-by-step that preceded and comprised the performance of the content analysis (ELO et al., 2014; SEURING; GOLD, 2012b; XIA et al., 2018).

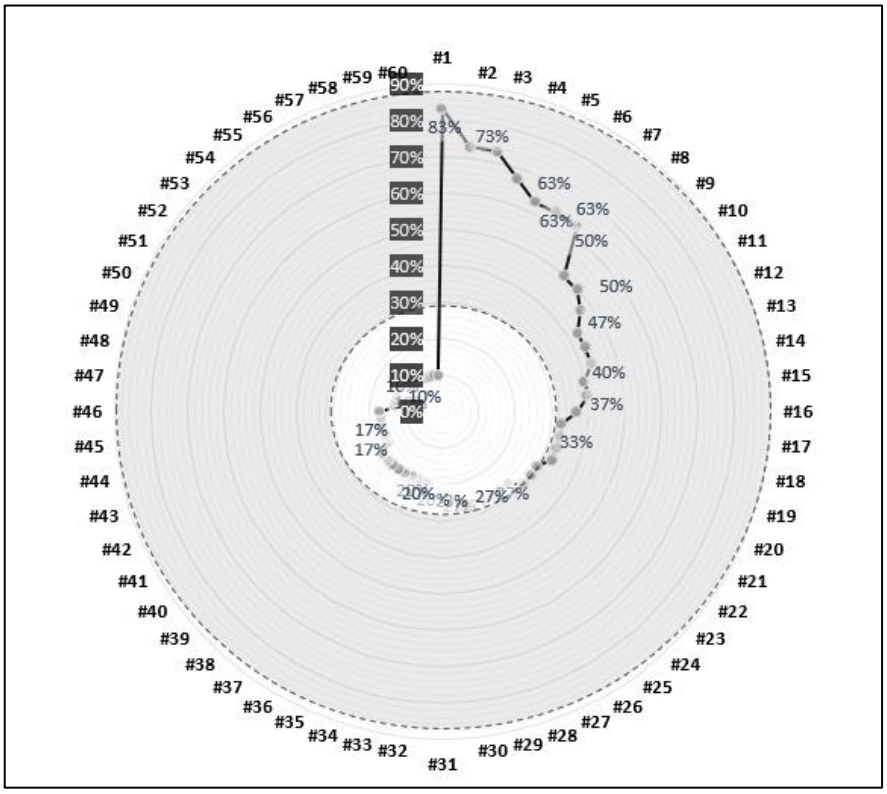
Codes created inductively may vary as the analysis is conducted due to the existence of different interpretations of constructs (BENGTSSON, 2016; SEURING; GOLD, 2012b). For this reason, the coding of the elements was performed repeatedly and adapted throughout the process of content analysis, working on discrepancies of interpretations and, whenever possible, aligning encoders to make the results more reliable. This strategy has been used by several researchers to analyze qualitative data (SEURING; GOLD, 2012b). In addition, the researchers themselves are the most well acquainted with the study and, therefore, the most prepared to understand and analyze the results (ELO et al., 2014). Hence, the experience of the authors of this work on the theme and the research method employed was important to ensure the quality of the analysis.

4.4 RESULTS AND DISCUSSIONS

The results presented and discussed in this section have the objective of answering if it is possible to contribute to state of the art in CS evolving from common bases. In order to achieve

this goal, the authors conducted a content analysis of the relevant literature (Appendix B) and summarized in six pillars the wide range of CS management knowledge produced and disseminated in the last ten years (2007–2017). As presented in the research method, a set of 60 elements for CS development and maintenance, with a minimum of 10% frequency, was identified in the 30 most-cited articles in CS from 2007 to 2017. These most frequent elements are highlighted in Figure 25.

Figure 25 - Frequencies of CS elements in the sample



Source: Nunhes, Bernardo and Oliveira (2020).

Elements with at least 30% frequency are highlighted in Figure 25. These elements led to the creation of the pillars, while the others were grouped together. Table 16 shows the 60 elements of Appendix C classified according to their frequencies and grouped in view of the management areas supporting their development. Details about the method used in the grouping phase can be found in Section 4.3 of this paper. In Table 18, the first left column shows the most frequent elements that led to the creation of the pillars. The second column presents the grouping of the other elements, and, finally, the third column shows the principles derived from the elements in the previous two columns. In this study, the pillars are macro elements of management reinterpreted to enable the integration of CS in the companies.

The elements cited in the relevant literature of the last ten years were grouped into six pillars, namely: corporate sustainability strategy; corporate governance; human resources management; knowledge and innovation management; measurement, disclosure and independent assurance; and management systems and integrated management systems.

Table 18 - CS elements and systematization of the management pillars

(continues)

#	CS Elements ≥ 30% Freq.	#	10% ≤ CS Elements < 30% Freq.	Pillars
7	Long-term orientation	38	Strategic partnerships to overcome market barriers and promote new products and services	Corporate sustainability strategy
9	Risk management	48	Planning market entry or development	
10	Business adjustment, improvement or redesign	53	Geographical and marketing segmentation	
18	Consideration of sustainability issues in purchase			
1	Cooperative relationship with stakeholders	27	Evaluation of a company's reputation and brand value	Corporate governance
5	Top management support	40	Publication of a corporate sustainability policy	
15	Codes of conduct/corporate governance/ethics	56	Promotion and sponsorship of projects geared toward sustainable development	
16	Legal compliance with regulation	60	Ethical commitments regarding 2nd and 3rd world countries	
20	Transparency in management			
22	Philanthropic responsibilities			
4	HR programs	26	Minority and diversity programs	Human resources management
12	Sustainability-oriented organizational culture	36	Multidisciplinary innovation meetings	
		43	Development of employee eco-initiatives	
		47	Teamwork and employee empowerment	
		55	Recruitment of local employees	
		59	Incentives and reward systems	
6	Eco-efficiency-oriented measures	28	R&D with multidisciplinary innovation project teams	Knowledge and innovation management
13	Product design aimed to innovation on environmental performance	29	Co-development with business partners (e.g., suppliers, R&D institutions, universities)	
19	Promotion of flexibility, learn and, if necessary, change in processes	35	Environmentally and socially superior products and services	
		37	Innovation discussion panel with customers	

Table 18 - CS elements and systematization of the management pillars

(conclusion)

#	CS Elements ≥ 30% Freq.	#	10% ≤ CS Elements < 30% Freq.	Pillars
		39	Fluid information exchange	

		45	Products and services with lower energy or maintenance costs for customers	
		49	Use of waste for revenue and re-usable packages to delivery materials	
		50	Open dialogue across management levels and functions	
		51	Sustainability management system	
		58	Inspiration from networks, conferences	
3	Factory inspections and audits	25	Sustainability indices and guidelines	
8	Corporate sustainability report	32	Standards of corporate governance, compliance, ethics	
23	Evaluation of sustainability business effect	57	Analysis of the impact of each stakeholder	Measurement, disclosure and independent assurance
2	Corporate sustainability performance measurement system			
11	Integration and balance of social, environmental, and business activities and responsibilities	24	Energy and water-saving projects	Management systems and integrated management systems
14	Health and safety initiatives	30	Integration of CS with management systems and/or integrated management systems	
21	Managerial best practices to promote sustainable supply chain management	31	Voluntary environmental restoration	
		33	Reduction of the likelihood of environmental accidents	
		41	Reduction of operations in environmentally sensitive locations	
		42	Handling of toxic waste, effluents, used products from customers, plastic residues, paper, and others	
		44	Occupational health and safety and human rights standards	
		52	Sustainability management system	

Source: Nunhes, Bernardo and Oliveira (2020).

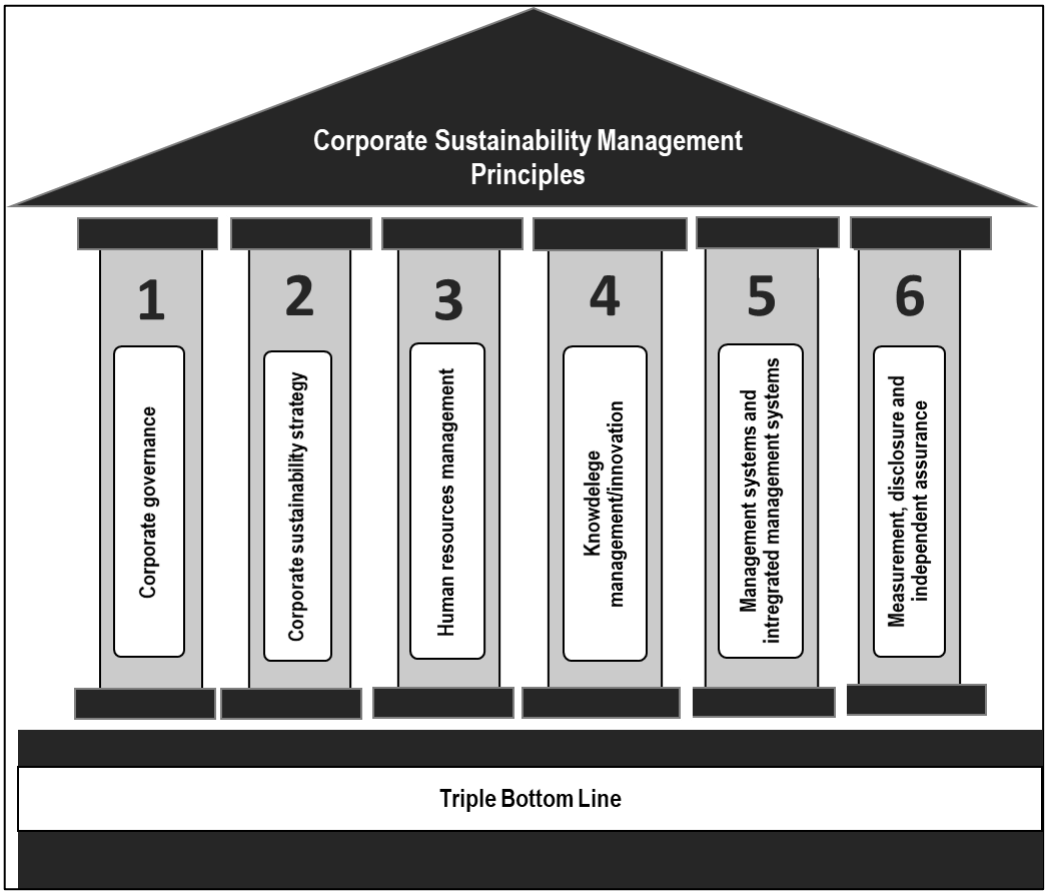
Derived from Table 18, it can be observed that all CS management pillars are transversal to the TBL elements. Therefore, it is considered that the elements of the economic, social, and environmental pillars of TBL are embedded in all CS management pillars, which have already been used to develop sustainability both in academia and in companies. This is because the purpose of this work is to contribute with novelty to the advancement of CS theory, using the knowledge consolidated by several authors over the years. Thus, the novelty of this proposal is to create a framework that brings together the best in the literature and those that are already being used in companies with outstanding CS performance.

The six CS management pillars (Figure 26) must be developed systematically in order to integrate and balance environmental, social, and economic management at all levels (strategic,

tactical, and operational) and environments (internal and external). The pillars are interrelated and the development of each pillar gives mutual support to the development of others, as can be seen in the following sections where they are described.

Each of the pillars will be discussed in light of the scientific literature and the authors' experiences. The individual discussion of the pillars may direct researchers in the advancement of the state-of-the-art on specific CS themes and assist managers in developing a management structure that addresses the main elements of sustainability.

Figure 26 - Proposed framework for CS management pillars



Source: Nunhes, Bernardo and Oliveira (2020).

4.4.1 Sustainable Corporate Governance

The corporate governance structure plays an important role in the implementation of the sustainability strategy, especially in the face of the scandals and risks of fraud that the corporate world has faced (ARAS; CROWTHER, 2008b; ECCLES; IOANNOU; SERAFEIM, 2014). Governance is the system according to which the company is directed, monitored, and

encouraged, aiming at the existence of a harmonious relationship with its stakeholders (MIRAS-RODR; MART, 2018). Reliable quality governance enables the creation of a decision-making environment in which transparency, accountability, responsibility, and fairness prevail in all organizational operations and relationships (ARAS; CROWTHER, 2008b; BAUMGARTNER, 2014; BOS-BROUWERS, 2009; TALIENTO; FAVINO; NETTI, 2019). This in itself already contributes to CS, but the achievement of social and environmental balance will require the adoption of other CG mechanisms, such as the legal and political system and ownership and board structures (ECCLES; IOANNOU; SERAFEIM, 2014).

The legal and political system of a company deals with regulations, norms, values, and organizational culture (MIRAS-RODR; MART, 2018). The values that guide governance may be present in codes of ethics and conduct, which, added to the governance manual, assist the top management in the exercise of its activities (BAUMGARTNER, 2014; BOS-BROUWERS, 2009). Governance codes are corporate regulations that guide the board of directors and managers to make decisions that are aligned with organizational goals and strategies (BAUMGARTNER, 2014; ECCLES; IOANNOU; SERAFEIM, 2014). They are influenced by the determinant mechanisms of CG such as the aforementioned legal and political system and the ownership and board structures (MIRAS-RODR; MART, 2018; WAHBA; ELSAYED, 2015).

The ownership structure represents the concentration or dispersion of ownership among shareholders, which affects the degree of risk diversification, since the greater the concentration of ownership, the more active in corporate decisions and the more risk-averse will the shareholder be. On the other hand, the greater the dispersion of ownership, the greater the pressure from shareholders on managers for business disclosure (MIRAS-RODR; MART, 2018).

As a result, the ownership structure may cause conflicts of interest between the majority and minority shareholders or between shareholders and the board (MIRAS-RODR; MART, 2018). For this reason, it is considered an important mechanism of CG and, although there is no consensus on its ideal configuration, the transparency in internal corporate control processes from the board structure is considered indispensable for the sustainability of the ownership structure (ECCLES; IOANNOU; SERAFEIM, 2014). In any case, it is emphasized that CEOs should maintain harmonious, power-sharing relationships with board members, seeking to avoid narcissistic behaviors that negatively impact the development of CS (ABATECOLA; CRISTOFARO, 2019).

The board structure can act as a complementary or substitution mechanism to the property structure (BEN-HASSOUN; ALOUI; BEN-NASR, 2018). Its main objective is to monitor the actions of top management and the way in which internal corporate control is carried out in order to promote corporate citizenship and combat opportunistic management and conflicts of interest, as previously mentioned (MIRAS-RODR; MART, 2018). For this, the board structure must be attended by managers and provide power and incentives to shareholders to participate in the management monitoring work. Other mechanisms can be defined according to the nature of the company, such as the size and independence of the board, compensation MSs, and protection of minority shareholders. (ANTOLÍN-LÓPEZ; DELGADO-CEBALLOS; MONTIEL, 2014; MIRAS-RODR; MART, 2018). It is important that the board evaluate the legal and political system of the company, paying attention to the preservation of ethics, especially in environments with great economic and cultural diversities (ADAMS; WHELAN, 2009; ISAKSSON; STEIMLE, 2009).

Governance mechanisms should also promote good corporate citizenship, through which responsibilities and good practices are adopted with investors, customers, suppliers, society, the environment, and regulatory agencies, considering the multiple aspects of the relationship with these stakeholders (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012). This systemic concern with transparent management and the organization's impacts on their stakeholders has a very significant positive impact on sustainability (CROWTHER, 2009; NAWAZ; KOÇ, 2019). However, the company that aims to develop sustainability in its business should always seek new ways to complement CG mechanisms with actions of socio-environmental balance.

In this sense, the insertion of sustainability issues in a direct and permanent way in decision-making is recommended (pillar 2), e.g., the engagement of the board with social and environmental responsibility and philanthropic actions; the adherence of international management standards and regulations, carrying out internal and external audits/external verifications based on international norms and guidelines such as GRI standards, AA1000 standard on accountability for sustainability, ISAE 3000 international standard on assurance engagements, SA8000 standard on social accountability and ISO 26000 standard on social responsibility (ASIF; SEARCY, 2014; GRIMM; HOFSTETTER; SARKIS, 2016; SIEW, 2015); the disclosure of sustainability results (pillar 5); and the compensation of managers and executives linked to the achievement of socio-environmental objectives (pillar 3) (BOS-BROUWERS, 2009; ECCLES; IOANNOU; SERAFEIM, 2014; MONTIEL, 2008).

4.4.2 Corporate Sustainability Strategy

CS is a strategic issue in the current economic landscape, in which companies are pressured to offer sustainable competitive advantage (GAO; BANSAL, 2013). With this, environmental and social issues must be considered together with economic issues and included in the company's strategic framework as an important and permanent part of its strategy (GAO; BANSAL, 2013). The CS strategy, in general, is defined in accordance with the motivations that led the top management to implement sustainability (BAUMGARTNER, 2014). Therefore, the CS strategy may reveal how economic, social, and environmental issues are approached, and the motivations that led top management to opt for a given type of orientation.

Baumgartner (2014) presented, based on a literature review, some reactive and proactive strategies models applied to CS. The introverted model, for example, translates into a reactive strategy aimed in mitigating environmental and social risks, focusing on compliance with applicable laws and regulations. The conservative model is more proactive and aims to achieve eco-efficiency through the development of CP programs. The visionary model involves the development of a proactive and holistic sustainability strategy that encompasses all business activities and provides stakeholders unique, innovative and balanced competitive advantages from the environmental, economic, and social points of view. Identifying and managing risks and opportunities, strengths, and weaknesses related to environmental, social, and economic aspects should be an essential part of the strategic planning of any organization that decides to be committed to sustainability, whether that commitment is strategically reactive or proactive. Risk management will assist in the early assessment of future scenarios and will support the formulation of the long-term CS strategy (BAUMGARTNER, 2014; GOYAL; RAHMAN; KAZMI, 2013b).

Long-term orientation is essential for the development of the CS strategy, especially the extroverted sustainable strategy, which seeks to influence the market by focusing on the development of lasting external relationships (BAUMGARTNER, 2014). CS depends on timeless conscious choices that take into account the mitigation of the economic and socio-environmental impacts generated in the present and the medium and long term (HAHN et al., 2015). It is, therefore, necessary to adapt, improve and, if necessary, redefine the business model in order to create an environment of mutual trust and cooperation with stakeholders for sustainable development (ECCLES; IOANNOU; SERAFEIM, 2014; SCHALTEGGER; FREUND; HANSEN, 2012). Building long-term relationships with stakeholders can result in a number of business benefits, such as integrating sustainability across the supply chain, the possibility of market segmentation with access to new customers, expansion operations without

incidence of resistance of neighbors, NGOs, or society, among others (BAUMGARTNER; RAUTER, 2017; ECCLES; IOANNOU; SERAFEIM, 2014; LINNENLUECKE; GRIFFITHS, 2010).

However, the integrated and long-term management of economic, environmental, and social aspects can become a complex task due to the tensions involved in the development of CS. Among the tensions that may hamper sustainable strategic management are technical, financial, market constraints, among other structural constraints that prevent decision-makers from implementing sustainability actions and programs; resistance to meeting demands for more sustainable products and services for fear of loss of legitimacy and risk of institutional disapproval; the difficulty of developing resilience to balance the sustainability pillars among similar companies that operate with homogenized solutions and little diversity to achieve efficiency; and the conflicts between short- and long-term orientations that reflect the paradigm between obtaining financial advantages in the present versus minimizing social and environmental impacts in the future (HAHN et al., 2015).

Faced with so many seemingly contradictory paradoxes and interests, many companies, unfortunately, end up giving up on moving forward with sustainability. It is, therefore, important that these and other potential tensions are recognized and strategically managed in order to advance on the path of sustainability. In this sense, (HAHN et al., 2015) explains that sustainability tensions may vary at different levels, according to the change process and the temporal and spatial context that surround them. Therefore, it is up to the company's top management to define a sustainability strategy that addresses the management of the tensions inherent in its business. All the other pillars of CS management that are discussed below consider important elements that will support the development and implementation of the CS strategy.

4.4.3 Sustainable Management of Human Resources

Human values influence the relationship between employees, which in turn reflects on organizational culture (BOS-BROUWERS, 2009; LINNENLUECKE; GRIFFITHS, 2010). Employees that are conscious of the sustainability strategy, satisfied and with stable contracts and permanence, have good production levels and contribute to sustainable development (LEE; FAFF, 2009). Human resources management (HRM) plays a key role in achieving this.

Human resources (HR) programs are important means of developing and training employees to work in an environment with an open-minded organizational culture regarding sustainability (BAUMGARTNER, 2014; LINNENLUECKE; GRIFFITHS, 2010; LOZANO, 2015). Employees should be gradually integrated into the various sustainability management tools, motivated and made aware of environmental and social objectives and goals, long-term orientation and other strategic aspects of sustainable business development (BAUMGARTNER, 2014; BOS-BROUWERS, 2009). Also, HR should make recruitment efforts to attract sustainability-conscious employees to the company (RENWICK; REDMAN; MAGUIRE, 2013). This is because an alignment of employee values with an organization's values is necessary for mutual motivation to develop CS (KANTABUTRA, 2019).

The recruitment, selection, remuneration, training, and integration practices of the new employees with the organizational culture should be adjusted in order to promote the inclusion of women, black people, people with disabilities since many social groups experience disadvantages with discrimination and prejudice (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; MONTIEL, 2008). HR in collaboration with top management should establish a positioning on diversity issues, inserting this subject into strategic planning and setting goals and indicators of diversity and inclusion to ensure, for example, equal employment opportunities, the participation of women in the board of directors, the inclusion of people with disabilities and generational balance (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; MONTIEL, 2008; ROCA; SEARCY, 2012).

HR management practices are determinant for the management of diversity and minorities, which is an aspect of social sustainability increasingly addressed by companies in the face of legal and regulatory pressures that aim to guarantee human rights and social justice in the work environment (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; LO; SHEU, 2007a). Therefore, implementing sustainability requires a redirection of the HR function, which must be adjusted to meet the demands of the sustainability strategy defined by the top management (CARRION; FERNANDEZ, 2018; RENWICK; REDMAN; MAGUIRE, 2013).

It is recommended that human resources be managed in an environment of participation and creativity, with an appreciation of teamwork and the development of incentive and rewards programs for employee empowerment. Employees can contribute with ideas and suggestions to improve the organization's social and environmental responsibility (HAHN et al., 2015; KANTABUTRA, 2019; LINNENLUECKE; GRIFFITHS, 2010). In addition to these practices, efforts should also be made to strengthen the communication channel with external stakeholders (BAUMGARTNER, 2014; LINNENLUECKE; RUSSELL; GRIFFITHS, 2009). In this sense,

meetings with partners and suppliers to exchange experiences and technological solutions; voluntary work of employees in the community and lectures and workshops on sustainability for customers and suppliers can be held.

Finally, HRM must be alert to signs of stress, anxiety, worry, and depression that put the mental health of employees at risk. Such symptoms lead to problems that must be managed according to their root cause, that is, by preventing, managing, or trying to alleviate suffering in the workplace (GISMERA et al., 2019).

4.4.4 Sustainable Knowledge and Innovation Management

Innovation management has the potential to leverage environmental performance improvements, which, in turn, can improve organizational efficiency as a whole (BAUMGARTNER, 2014). Investing in technology to reduce the amount of emissions and waste, for example, makes a cost reduction in raw materials and energy possible. Thus, it is suggested that environmental sustainability can complement economic sustainability through knowledge management and innovation, and this investment in green innovation can lead to increased competitiveness in the market, especially in the sustainable business market (BAUMGARTNER, 2014; ECCLES; IOANNOU; SERAFEIM, 2014).

Innovation management should focus on combining economic gains with the reduction of impacts on the environment and society in the short- and long-term, because after all, not all innovation is sustainable (BAUMGARTNER, 2014; BOS-BROUWERS, 2009). The strategy of differentiating products and services should be based on beneficial innovations from the environmental and social points of view, involving, for example, the reduction of energy use in the production process, waste reduction of production inputs, the reuse of waste, the use of reusable packaging for delivery of materials, and the production of goods with lower maintenance costs for customers. For this reason, multidisciplinary R&D teams should be responsible for maintaining projects of green technology development and co-development with partners (e.g., universities, suppliers, customers) to improve environmental and social performance through redesign and improvement of products, processes, and services (BOS-BROUWERS, 2009; LEE; FARZIPOOR SAEN; FARZIPOOR, 2012).

The development of CS needs to act as a transforming and innovative force in all the functions of the organization (BAUMGARTNER, 2014; BOS-BROUWERS, 2009). However, the implementation of changes resulting from sustainability-oriented innovation management processes requires a flexible and open-minded organization (LI; TARAFDAR; RAO, 2012). In

this sense, knowledge management (KM) practices can help in the institutionalization of innovative behaviors, products, and processes (LI; TARAFDAR; RAO, 2012; ZENG et al., 2014). KM practices involve the processes of creation, dissemination, and use of knowledge from sources such as the organization itself, information technology, and collaborators (LI; TARAFDAR; RAO, 2012; SCHARF; SIERRA, 2008).

The creation and application of knowledge can improve the communication flow between top management and employees and facilitate the dissemination of the sustainability-oriented organizational culture (SAIDE; MAHENDRAWATHI, 2015). In addition, stakeholders have increasingly requesting information about the choices, investments, and actions taken by companies that occupy a prominent position in sustainability in the market (CROWTHER, 2009; LEE; FARZIPOOR SAEN; FARZIPOOR, 2012).

The pillar of knowledge management and innovation is essential to respond to this type of pressure because its development will support the availability of information and knowledge in accessible and usable formats to all stakeholders (TYAGI et al., 2015). Specifically, KM processes can support the development of the following pillar “measurement, disclosure and independent assurance”, providing tools for managing and providing data and information on social, economic, and environmental issues.

The knowledge management and innovation pillar should focus on the development of sustainability through the creation of a company with digital connectivity that constantly optimizes its operations in a 4.0 industry atmosphere (NAWAZ; KOÇ, 2019).

4.4.5 Measurement, Disclosure, and Independent Assurance of Corporate Sustainability

Corporate sustainability performance (CSP) is an important element for the achievement of objectives for sustainable business development, such as those proposed by the Organization for Economic Co-operation and Development (OECD) guidelines for multinational enterprises, the DJSI, the UNCG and GRI guidelines, and the WBCSD initiatives (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012).

CSP aims to monitor and evaluate the incorporation and management of economic, social, and environmental aspects in the company’s activities, considering a prior analysis of the impact of these activities on the environment and society (ARTIACH et al., 2010; LEE; FARZIPOOR SAEN; FARZIPOOR, 2012). It is interesting that the company maintain a sustainability performance evaluation system (SPMS) to evaluate the advances or setbacks obtained with the implementation of sustainable practices, also called “sustainability business

effect". The SPMS promotes the diagnosis and evaluation of the objectives, goals, and sustainability indicators inherent to the sustainability strategy adopted by the company (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; SEARCY, 2012). The implementation of an SPMS basically involves three phases, namely, (1) the definition of corporate and sectoral indicators (KPIs), (2) the implementation and use of KPIs and integration in processes and organizational structure, and (3) SPMS improvement (SEARCY, 2012).

In defining the set of KPIs, it is important to relate the effectiveness of each KPI to the achievement of a particular objective in the TBL areas, or more specifically, with the areas of sustainability performance proposed; for example, by GRI, economic performance, market presence, indirect economic impacts, procurement practices, anti-corruption, anti-competitive behavior (economic pillar), materials, energy, water and effluents, biodiversity, emissions, effluents and waste, environmental compliance, supplier environmental assessment (environmental pillar), employment, labor/management relations, occupational health and safety, training and education, diversity and equal opportunity, non-discrimination, freedom of association and collective bargaining, child labor, forced or compulsory labor, security practices, rights assessment, local communities, supplier social assessment, public policy, customer health and safety, marketing and labeling, customer privacy, and socioeconomic compliance (social pillar) (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; ROCA; SEARCY, 2012).

It is also necessary to define optimal numbers of KPIs based on the organization context, to consider the use of composite indexes, and to develop criteria for addressing conflicting objectives (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; SEARCY, 2012; WOLF, 2014). At this stage, managers responsible for the SPMS may take as a basis the CS KPIs present in guidelines and standards related to sustainability, adapting them to the scope of application (ASIF et al., 2013; LEE; FARZIPOOR SAEN; FARZIPOOR, 2012).

In the implementation and use of the indicators phase, it is necessary to consider and manage the existence of failures in the data and information gathering that feed the SPMS, to identify the most impacting indicators in the sustainability performance, and to explore the possibilities of using financial and non-financial indicators in the accountability and disclosure of sustainability information (LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; SEARCY, 2012). The SPMS results should then be used as input in the decision-making process and for the continuous improvement of the SPMS itself. The continuous improvement should involve the re-evaluation and possible re-adaptation or replacement of the indicators (ADAMS; WHELAN, 2009; ROCA; SEARCY, 2012).

Accountability for economic, social, and environmental progress is an increasingly common practice in promoting value creation and communication with stakeholders (CROWTHER, 2009; MAAS, 2016). This is developed through the publication of integrated reports, which present financial and sustainability information integrated into a single document with the objective of making public the position of the company with respect to sustainability (MAAS, 2016; ROCA; SEARCY, 2012). The sustainability report is a channel for communicating with stakeholders through which the company details its strategies, operations and business in the short, medium, and long term (BOS-BROUWERS, 2009; MAAS, 2016). Through it, the dialogue with stakeholders is developed by enabling, for instance, that problems and opportunities for improvement be pointed out by the public who have access to the company's sustainability report.

Sustainability reports should be an overview of the company's activities; however, its credibility has been questioned due to the widespread use of biased language and the omission of data and negative aspects towards obtaining a positive image in the market (BOIRAL; HENRI, 2017; MAAS, 2016; WASARA; GANDA, 2019). Disclosure of information about CS is voluntary in many countries and, therefore, many companies do not follow formal rules or regulations on the form and content of disclosure (WASARA; GANDA, 2019).

For this reason, independent assurance of sustainability reports is recommended in order to assess the quality, comparability, and credibility of information made available to the public (BEN-HASSOUN; ALOUI; BEN-NASR, 2018). This verification goes beyond traditional accounting and quality audits, also involving external verifications based on international norms and guidelines such as GRI standards, the AA1000 standard on accountability for sustainability, the ISAE 3000 international standard on assurance engagements, the SA8000 standard on social accountability and the ISO 26000 standard on social responsibility (ASIF; SEARCY, 2014; GRIMM; HOFSTETTER; SARKIS, 2016; SIEW, 2015). It should be noted that although external verification is recommended, it is not a mandatory requirement of GRI, and the companies wishing to carry it out can self-report this information in their sustainability report.

4.4.6 Sustainable Management Systems and Integrated Management Systems

MSs provide important data and information for evaluating the CSP since the management of much of the economic, social, and environmental issues that the organization has responsibility for are concentrated in them (NAWAZ; KOÇ, 2018). According to ISO, a

MS is “a set of guidelines used to manage the interrelated parts of the business in order to enable the proposed objectives to be achieved” (ISO 2019). Some MSs can be certified and, in this case, they are models based on expert opinions that express by means of guiding and/or mandatory requirements of what organizations can do to implement and maintain a cycle of continuous improvement of operations (ISO 2019). There are several studies that highlight the contribution of MSs to the sustainable development of organizations, mainly relating economic performance with ISO 9001 (JORGENSEN, 2008; QI et al., 2013; RYBSKI; JOCHEM; HOMMA, 2017); environmental performance with ISO 14001 and EMAS (FONSECA, 2018; JORGENSEN, 2008; LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; QI et al., 2013), and social performance with ISO 26000, SA 8000 and OHSAS 18001 (JORGENSEN, 2008; LEE; FARZIPOOR SAEN; FARZIPOOR, 2012; QI et al., 2013), the latter replaced in 2018 by ISO 45001.

ISO 9001 is a certifiable standard that establishes the requirements of a QMS and is naturally related to the economic dimension of sustainability (KLUTE-WENIG; REFFLINGHAUS, 2015). However, ISO 9001 also addresses requirements related to the social dimension, such as responsibility and customer orientation, stakeholder needs analysis, labor practices, training and education, and fair practices of responsible supply chain management and operation (KLUTE-WENIG; REFFLINGHAUS, 2015; RANÄNGEN; CÖSTER; ISAKSSON, 2018). Additionally, the 2015 version of ISO 9001 contains requirements related to the development of knowledge management, which, in turn, contributes to the development of CS, as discussed in detail in pillar 4. ISO 14001 has the potential to contribute directly to environmental sustainability because it provides a framework of technical and administrative requirements to develop and maintain a certifiable environmental MS balanced with socioeconomic needs (NEVES; SALGADO; BEIJO, 2017). Some studies also suggest that ISO 14001 positively impacts the economic dimension due to the reduction of costs obtained with improvements in process efficiency and access to new customers due to the projection of a better image into the market (MALETIC, 2015). ISO 45001 establishes the requirements of an occupational health and safety MS and contributes to the development of social responsibility. Despite this, in order to contribute more significantly to social sustainability, it is recommended to complement these MSs with the requirements of ISO 26000 (corporate responsibility), SA 8000 (social accountability), and AA1000 (sustainability assurance) (KLUTE-WENIG; REFFLINGHAUS, 2015).

In 2008, Jorgensen already argued that the implementation of MSs and their subsequent integration could strengthen the interrelationship between the different areas of the business,

creating a transversal connection for the integration of sustainable best practices (JORGENSEN, 2008). The author also highlighted the importance of extending the focus of MSs to include the management of external relationships along the supply chain, thus contributing to sustainable business development. However, for a long period of time, an integrated management strategy was only considered for ISO 9001 and ISO 14001 standards, sometimes including OHSAS 18001. From 2013 onwards, SA 8000 and AA1000 have also been incorporated more frequently into IMSs with the objective of addressing CSR in business (ASIF et al., 2013). As suggested by (KARAPETROVIC; CASADESÚS, 2009), it is observed that more comprehensive IMSs have been gradually developed, mainly following the publication of new MS standards by the ISO (International Organization for Standardization) and the ITU (International Telecommunication Union).

According to the ISO, the main motivation for the revision and publication of standards and guidelines comes from the need to provide patterns that are aligned with the real stakeholders' needs and expectations, who are becoming increasingly aware and interested in the positioning of companies with regard to the management of its impact on society and the environment (ISO 2019). This fact explains the increasing number of standards and guidelines dedicated to addressing sustainability issues in different areas and sectors. However, it must be acknowledged that many criticisms are made around the adoption of international standards because sometimes they are implemented due to external pressures and have the sole objective of obtaining certification, with no prospects of achieving real improvements for the sustainability of the business (GIANNI; GOTZAMANI; TSIOTRAS, 2017; WITJES; VERMEULEN; CRAMER, 2017).

In light of this, (GIANNI; GOTZAMANI; TSIOTRAS, 2017) argues that the lack of an international certification for IMSs causes integration to be motivated by internal reasons, which positively impacts the performance of the IMS and its integration with the strategy. Therefore, it is suggested that, based on IMS, companies can manage a wide variety of objectives related to key areas of CS, thus contributing to the effectiveness of the CS strategy. In this sense, one aspect to be considered is the definition of the scope of the IMS, identified by (GIANNI; GOTZAMANI; TSIOTRAS, 2017) as a possible contingent factor in CS performance that needs to be empirically investigated. This assessment of the scope of the IMS is especially relevant because, as previously highlighted, an increasingly broader range of integrable MSs is currently available. In this way, depending on the focus that the MSs present, the IMS could be more or less effective in meeting stakeholders' needs. Table 19 presents some MSs (certifiable and not certifiable) related to the TBL of CS.

The MSs shown in Table 19 cover important aspects for the development of CS, which are addressed in the pillars presented in this study. Unfortunately, the relationship of most of these systems to CS has not been sufficiently explored in the literature of IMS (NUNHES; OLIVEIRA, 2018; NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016).

Table 19 - Management standards, guidelines, and regulations approaching TBL aspects

(continues)

TBL FOCUS AREA(S)	MANAGEMENT STANDARD/GUIDELINE/REGULATION
ECONOMIC	- ISO 9001 Quality management system - ISO 44001 Collaborative business relationship management systems - ISO 37001 Anti-bribery management system - ISO 22301 Business continuity management system
ENVIRONMENTAL	- ISO 14001 and EMAS—Environmental management system - ISO/DIS 24526 Water efficiency management systems - ISO 50001 Energy management system - ISO 14064 Carbon management system

Table 19 - Management standards, guidelines, and regulations approaching TBL aspects (conclusion)

TBL FOCUS AREA(S)	MANAGEMENT STANDARD/GUIDELINE/REGULATION
SOCIAL	- ISO 45001 Occupational health and safety management system
	- ISO 18788 Management system for private security operations
	- SA 8000 Social Accountability
	- ISO 19600 Compliance management system and AA1000AS Assurance standard
	- ISO 28001 Security management system for the supply chain
	- ISO/IEC 27001 Information security management system and ISO/IEC 2000-1 Service management system
ECONOMIC, ENVIRONMENTAL AND SOCIAL	- ISO 30401 Human resource management—Knowledge management systems
	- ISO 31000 Risk management system
	- ISO 26000 Guidance on social responsibility
	- British BSI PAS 99; Danish DS 8001; Spanish UNE 66177; Australia/New Zealand AS/NZS4581 Integrated management system
	- BS 8900 Managing sustainable development

Source: Nunhes, Bernardo and Oliveira (2020).

Thus, in line with Gianni, Gotzamani and Tsiotras (2017 and Wijtes, Vermeulen and Cramer (2017), the authors of this work suggest that further studies should be conducted in order to understand the use of IMS as a CS developer, especially considering combinations of MSs not studied or studied but not intensively (eb.g., ISO/IEC 27001, ISO 22301, ISO 31000, ISO 37001, ISO 50001, AA1000) and their possible contributions to a better integration and performance of CS.

4.5 CONCLUSIONS

This paper aims to systematize the guiding pillars of CS management. This objective was achieved through the conduction of a content analysis of the 30 most-cited academic articles on CS from 2007 to 2017. As a result, six pillars for CS management were systematized: sustainable corporate governance; corporate sustainability strategy; sustainable management of human resources; sustainable knowledge and innovation management; measurement, disclosure and independent assurance; and sustainable MSs and integrated management systems.

It is concluded that CS will only have effect once sustainability issues are formally integrated into corporate management structures. This is because BS needs to be developed at all organizational levels, whether internal or external, and requires planning and multi-stakeholder engagement, among the most important aspects.

The proposed reframing of management structures for developing CS was achieved by grouping the elements into pillars, which made the proposal of a management structure possible, based on existing elements in the literature.

Regardless of the type of focus to be considered (whether environmental, social, or both), it is recommended the set of pillars of sustainability management presented in this paper be taken into account since they are transversal to the areas of the TBL and can support the integration of sustainability into the organizational structure.

This paper draws attention to the fact that studies in CS need not only revise but also to use the knowledge generated over the years by the academic community to further advance studies of various CS subthemes. As suggested in the title of the article, it is necessary to rethink the ways of doing business, and, for this, the development of CS in management structures has been proven to be an essentially important aspect.

The theoretical contributions are to provide researchers with some of the most important publications of the CS field, to promote the theoretical–scientific defragmentation of the literature on CS by bringing the main findings together to advance the state-of-the-art in this field, and to subsidize the development of further CS frameworks, instruments, and analyses.

This study contributes to the advancement of CS theory, using the knowledge presented in several important papers over the years. Therefore, the novelty of this proposal is to create a framework that brings together the most cited works in the CS literature and those that are already being used in companies with outstanding CS performance to support and promote the integration of sustainability in business processes.

As applied contribution, managers can consider the development of the presented pillars in companies, based on the development of the elements of CS identified. With this, they will have a management basis to support and promote the integration of sustainability in business processes. In this sense, it is argued that this study is a starting point towards structuring a management basis for supporting and promoting sustainable business development at all levels and areas of a company.

The discussion of the CS management pillars provided understanding to researchers and managers on the main aspects that make up the integration of this construct in a company from a management point of view. CS is a very comprehensive concept, and approaching it under different prisms as done in this paper is important to understand in depth the wide spectrum of elements that it is made up of.

The results of this study are limited to the literature findings of the analyzed articles and should be complemented with more practical managerial suggestions. Therefore, it is suggested that empirical analysis could discuss the proposed pillars of CS beyond the literature by checking them against the day-to-day life of companies from different industries, sizes, and countries.

In addition, due to the delimitation of the number of articles that were analyzed, it is recommended that future studies continue the study of the fundamental bases of sustainable management and add new elements to the pillars (and eventually new pillars) insofar as the state-of-the-art in CS advances.

5 GUIDING PRINCIPLES OF INTEGRATED MANAGEMENT SYSTEMS: TOWARDS UNIFYING A STARTING POINT FOR RESEARCHERS AND PRACTITIONERS

The article resulting from this step (NUNHES; BERNARDO; OLIVEIRA, 2019) was published in the "Journal of Cleaner Production" and is presented throughout this chapter.

5.1 INTRODUCTION

The globalization of the economy, the increased competition in the market and the financial crises have conditioned organizations to operate in a competitive, uncertain and turbulent environment (OLIVEIRA, 2013). To survive in this scenario, companies need to meet the demands of their consumers, who are increasingly expecting improved products and services in terms of price and quality; and other stakeholders, who generally expect a greater companies' commitment to ethics, human beings and the environment (DELAI; TAKAHASHI, 2013; OLIVEIRA, 2013). In order to meet this wide range of stakeholders' needs, companies have increasingly implemented MSs, with emphasis on QMS, EMS, OHSMS and, more recently, CSRMS (ABAD; CABRERA; MEDINA, 2016; KLUTE-WENIG; REFFLINGHAUS, 2015).

Inasmuch as more systems are deployed and maintained, management as a whole becomes more difficult due to the greater number of activities to be managed, which can lead to problems in their execution and control, excessive bureaucracy, high costs, etc. (OLIVEIRA, 2013; SAMPAIO; SARAIVA; DOMINGUES, 2012). Faced with this and considering the similar structure that the aforementioned MSs were designed, the IMS is seem to be a suitable strategy for the management of multiple needs and expectations of stakeholders (ABAD; DALMAU; VILAJOSANA, 2014). In an IMS, the elements and functions that are common to the various systems (QMS, EMS, OHSMS, CSRMS, among others) could be gradually integrated in order to ensure a more efficient management, that is, that saves resources, time and reduces efforts by eliminating duplication of tasks, procedures and other bureaucracies (NUNHES; FERREIRA MOTTA; OLIVEIRA, 2016; ZENG et al., 2011). The studies on IMS began before the 2000s (e.g., pioneers KARAPETROVIC; WILLBORN, 1998; ZWETSLOOT, 1995) and since then it has been developed in a basically progressive way, with many researches being published on this subject every year (BERNARDO et al., 2017; DOMINGUES et al., 2016b).

Recently this area has reached a significant level of development. The studies directed to IMS have gone, in large part, to present approaches to amalgamate the knowledge generated in the last two decades. According to Domingues et al. (2016b) this analysis of successful cases, evolutions, discussions, etc. are extremely necessary so that benchmarking can be promoted and thus solid foundations for the development of the IMS area can be built. Some articles recently published in this line include the development of a model to assess the maturity level of IMSs (DOMINGUES et al., 2016b), the presentation of a theoretical overview on the evolution of IMS research and opportunities for future studies (NUNHES; FERREIRA MOTTA; OLIVEIRA, 2016); the literature review conducted specifically to identify IMS benefits and difficulties (BERNARDO et al., 2015); and the empirical analysis on IMS from the perspective of companies located in different countries and from various sectors and sizes (BERNARDO et al., 2017; GIANNI; GOTZAMANI; VOUZAS, 2017; MOUMEN; EL AOUFIR, 2017).

One can observe in the literature the identification of some structural elements, such as CSFs (LOPEZ-FRESNO, 2010; REBELO; SANTOS; SILVA, 2016; SANTOS et al., 2017) and key drivers (GRIFFITH; BHUTTO, 2008; MOUMEN; EL AOUFIR, 2017; SAMPAIO; SARAIVA; DOMINGUES, 2012) to provide some starting point for the development of researches. However, we observed that these elements were not systematically identified in the literature, which resulted in scattered bases that vary significantly from study to study. In this study we try to move towards a unification of the bases of the IMS from a theoretical perspective. The research question that guided this study is as follows: “What are the guiding principles and the essential elements for IMS development and maintenance?”. The objective of the study is to establish, through a systematic content analysis focusing on the 30 most cited articles from 2006 to 2016, the guiding principles of IMS and the essential elements for its development and maintenance in order to move towards unifying a starting point in the literature.

In the sequence, a synthesis of the theoretical framework on IMSs will be presented, followed by the research method section and the section of results and discussions, which will address the process of systematizing and discussing the guiding principles of IMS in the light of the scientific theory and empirical studies published. The conclusions section closes the paper.

5.2 LITERATURE REVIEW ON INTEGRATED MANAGEMENT SYSTEMS

IMS interconnects a set of processes through sharing information, human and financial resources and infrastructure in order to satisfy the needs of different stakeholders (BERNARDO et al., 2016; KOPIA; KOMPALLA; CEAUŞU, 2016). It has been much discussed in the academic community of MSs, and as a result, a wide field of research in this area has been developed (BERNARDO et al., 2017; DOMINGUES et al., 2016a; NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016). Pioneering studies such as Zwetsloot (1995) and Karapetrovic and Willborn (1998) pointed out that the areas that comprise the MSs influence each other. Therefore, the individual optimization of the systems is, at its best, a sub-optimization if evaluated from a broader managerial perspective.

Griffith and Bhutto (2008) point out that the needs of the corporate business are holistic and for this reason, it is necessary to rethink the IMS system's focus in accordance with these various needs. Asif et al. (2009) developed a systemic approach for IMS that is supported by the top management through the inclusion of integration elements in strategic planning, in resource allocation process, in promotion of organizational culture, and in the joint design and management of key processes. According to Lopez-Fresno (2010) the holistic view of the IMS is important to achieve the objectives in a joint and integrated manner, reducing the chances of having a functional and restricted approach, which could hamper the development of the IMS.

Standardization helps ensure the unity of the IMS and is supported by the common structure of the various MS standards, which are identical in nature and share key concepts that facilitate the implementation and integration of other systems. The integrated management of the common elements strengthen the system uniformity (JØRGENSEN, 2008). The elements and functions most commonly integrated are manuals, policies, objectives and goals, structure and responsibilities, top management, work instructions, document and record control, training, internal communication, emergency response, performance indicators, nonconformity management, control of monitoring and measuring equipment, preventive and corrective actions, internal and external audits and critical analysis (NUNHES; MOTTA BARBOSA; DE OLIVEIRA, 2017; SANTOS et al., 2013). Other activities and operations that are not possible to be integrated should be, whenever possible or desirable, redesigned in such a way that they become synergic with the integrated elements and functions (ASIF et al., 2010b; OLIVEIRA, 2013).

The IMS literature has shown that the integration of common elements to the systems can help reduce bureaucracy resulting from the management of isolated functions (ASIF et al.,

2010a; NUNHES; MOTTA BARBOSA; DE OLIVEIRA, 2017; SANTOS; MENDES; BARBOSA, 2011). The elimination of excessive bureaucracy from the processes improves the work of the employees and stimulates the teamwork (ASIF et al., 2013; OLIVEIRA, 2013).

Bernardo et al. (2015) conducted a literature review in the Web of Science, Science Direct, Scopus and Emerald databases to identify the benefits and difficulties arising from implementation and use of IMSs. In all, 18 empirical articles were analyzed and the results showed that the companies which integrate their MSs have obtained more benefits when compared with companies that choose to manage the systems separately. Among the IMS benefits highlighted in the studies by Abad et al. (2014) and Bernardo et al. (2015) are: improvement in efficiency through optimization of resource use, time, etc.; improvement in capacity to meet customer needs; higher level of employee satisfaction, which involves improvement in motivation, organizational climate and capacity for teamwork; improvement in communication and knowledge sharing; improvement in the systematization of procedures, work instructions, definition of responsibilities, etc.; reduction of bureaucracy; improvement of the organizational image and market competitiveness and better relationship with stakeholders.

Regarding the difficulties faced in implementing IMSs, Simon, Karapetrovic; and Casadesús (2012) verified four main clusters of difficulties, which are: lack of resources for integration; difficulties with the implementation and certification of MSs according to standards; internal difficulties; and difficulties of understanding and use of norms by employees. The first cluster of difficulties is related to the lack of resources such as financial capital, knowledge, technology, time, consultants, specific guidelines for systems integration, etc. (BERNARDO et al., 2012b; SIMON; KARAPETROVIC; CASADESÚS, 2012). Faced with these impossibilities, the integration of the MSs is carried out to a limited extent, based on the managers' own experiences, which although committed to the project, often do not have the necessary know-how to implement the IMS, train employees to be knowledge multipliers, create means to spread the new IMS culture in the company, etc. (ASIF et al., 2009; OLIVEIRA, 2013).

As to the second cluster, the difficulties are related to the dissimilarities that still exist among the standards and that complicate the integration (ABAD; DALMAU; VILAJOSANA, 2014). With regard to the internal difficulties, it is important to note that organizations traditionally maintain working groups separated, and their integration can generate cultural conflicts, resistance to change and communication, etc. (BERNARDO et al., 2012b; ZENG; TAM; TAM, 2008). The fourth cluster is related to the difficulties arising from the lack of motivation, attitude and expertise of the employees in using the standards, which can also affect

the execution of the tasks in an integrated way (BERNARDO et al., 2012b; SIMON; KARAPETROVIC; CASADESÚS, 2012).

IMS needs strategic support from IMS models and methodologies to help companies to achieve the expected results (KARAPETROVIC; CASADESÚS, 2009; OLIVEIRA, 2013). In order to be a basis for IMS, the model have to: a) provide the foundation to integrate the common elements of different MSs, b) be generic and applicable to all types of organizations and accommodate the further integration of other MSs into the IMS, c) be flexible to meet the multiple needs of IMS systems, d) be compatible with individual systems management models (such as PDCA) in order to facilitate the transition to IMS, and e) be supported by related methodologies to manage the IMS (JONKER; KARAPETROVIC, 2004).

Both academics and certification bodies have proposed models and methodologies for IMS implementation considering its main purposes and objectives (BERNARDO et al., 2012a; DOMINGUES; SAMPAIO; AREZES, 2015; OLIVEIRA, 2013). The implementation and use of different methodologies lead companies to achieve different results and levels of integration (DOMINGUES et al., 2016a). The lack of a common understanding on the main aspects of integration to avoid this type of disparity is pointed out by (NUNHES; OLIVEIRA, 2018).

Asif et al. (2009) presented an overview of some strategies for IMS implementation and pointed out that they are largely limited. The authors argued that the IMS models reviewed were supported by incomplete methodologies Table 20.

Wilkinson and Dale (1999) highlighted that the use of standards as a basis for the design of integration models can limit the models developed for two main reasons: 1) standards do not address the organizational culture and 2) the addition of other standards increases the complexity of the model.

Regarding the first question raised by Wilkinson and Dale (1999) and corroborated by Jørgensen (2006), it is argued that the new versions of ISO 9001 and ISO 14001 standards (both published in 2015) are already leading the top management to reflect on the understanding the organization and its internal and external context (ISO, 2018). The ISO structure began to suggest, albeit timidly in the notes to users, that the values and organizational culture can be considered in the analysis of the internal context.

Jørgensen (2006) pointed out that the management model of ISO 14001:2004 left something to be desired as it did not approach the stakeholder engagement and the product chain. However, over the years there has been a global trend towards the institutionalization of sustainable development in business processes and a greater engagement in dealing with social and environmental responsibility issues has been noticed.

Table 20 – IMS models and their respective theoretical and conceptual basis

(continues)

AUTHOR(S)/YEAR	ABOUT THE MODEL	BASIS	
		CONCEPTUAL	EMPIRICAL
Karapetrovic and Willborn (1998)	The authors present a model of a generic performance MS and a model for integrated audit system	- ISO 9001 - ISO 14001 - Systems approach - Authors theoretical framework	-
Wilkinson and Dale (2001)	IMS model based on empirical research addressing the issues of scope and culture	- Key IMS issues identified in by Wilkinson and Dale (2000)	- Survey conducted among companies (57 valid answers)
Labodová (2004)	Model for IMS implementation using a risk analysis-based approach	- Plan-Do-Check-Act (PDCA) methodology - OHSAS 18001 - Risk-management approach - Authors conceptual framework	- 2 case studies
Rocha, Searcy and Karapetrovic (2007)	IMSs implementation model for enhance sustainability in business infrastructure	- Authors theoretical framework - Systems approach	-
Zeng et al. (2007)	Multi-level synergy model (strategic synergy, organizational structural-resource-cultural synergy, and documentation synergy) for an effective implementation of IMS	- Authors literature review	- Survey conducted among companies (104 valid answers)
Jorgensen (2006)	IMS model based on a culture of learning and continuous improvements with three ambition levels of integration	- Authors theoretical framework - ISO Guide 72 - ISO 9001:2000 - ISO 14001:2004 - OHSAS 18001:2000 - PDCA methodology	- IMS standards in Denmark and Spain are analyzed regarding the ambition level for integration
Asif et al. (2009)	Process-based strategy for IMS implementation and institutionalization	- Author's literature review	-
Lopez-Fresno (2010)	Model based on a systemic approach that proved successful for the design and implementation of an IMSs in an airline	- Author's literature review	- 1 case study

Table 20 – IMS models and their respective theoretical and conceptual basis

(conclusion)

AUTHOR(S)/YEAR	ABOUT THE MODEL	BASIS	
		CONCEPTUAL	EMPIRICAL
Rebelo et al. (2014)	Flexible integrator and lean model for IMSs	- ISO Guide 72 - PDCA methodology - Authors literature review	- 1 case study
Domingues et al. (2016)	Maturity Model for IMS Assessment	- 8 excellence management pillars - Authors literature review	- Survey conducted among companies (53 valid answers) - Survey conducted amid experts' panel (7 respondents)
Majerník et al. (2017)	Innovative model for IMSs implementation and maintaining according to the revised ISO standards	- ISO High-Level Structure - PDCA methodology	-

Source: Nunhes, Bernardo and Oliveira (2019).

Now the need for organizations to understand the needs and expectations of interested parties is a mandatory requirement of ISO 9001, ISO 14001 and ISO 45001 (occupational, health and safety MS). In addition, ISO 14001:2015 recommends that organization should consider a life cycle perspective when determining environmental aspects (ISO, 2018).

Several models were based on the PDCA methodology (JORGENSEN et al., 2006; LABODOVÁ, 2004; MAJERNÍK et al., 2017) and the ISO high-level structure (MAJERNÍK et al., 2017). The Annex SL (or ISO high-level structure) is the new structure present in ISO standards. It is divided into 10 chapters that aims to improve the integration between the ISO family management standards (ISO/IEC, 2016). The ISO high-level structure is already present in the ISO standards that had revisions published from 2015 onwards, such as ISO 9001 and ISO 14001 (both revised in 2015) and ISO 45001 (published in 2018).

Fonseca (2018) emphasizes that the integration approach present in the revised versions of ISO has been received in a positive way by the companies that see integration an alternative that can bring them benefits. The adoption of new terminologies and the introduction/reinforcement of approaches to revised ISO standards are important points to be discussed. With regard to terminology, it is noted that there is no longer the term "exclusions" and "management representative"; the term "products" has been replaced by "products and services"; documented records, procedures, among others documents are now referred to "documented information"; "work environment" changed to "environment for the operation of

process ", "purchased product" changed to "external provider" and "supplier" changed to "external provider" (FONSECA, 2015). Regarding the introduced/reinforced approaches, the revised versions of ISO standards highlight the importance of Risk-Based Thinking, Interested Parties, Change Control, Strategic Direction, Knowledge Management and Leadership (NUNHES; OLIVEIRA, 2018).

The ISO high-level structure (HLS) is gradually being included in the ISO revised standards in order to make the MSs compatible, and linking them to the PDCA methodology phases, where Plan comprises the ISO clauses 4, 5, 6, 7; Do - clause 8; Check - clause 9 and Act - clause 10 of new the standards with the HLS structure (ISO, 2018; MAJERNÍK et al., 2017; REBELO; SANTOS; SILVA, 2014a). In view of all these changes, one can note a significant evolution of the ISO standards model to a more suitable structure for integration. Although the latest ISO standards still present some limitations concerning organizational culture, it is argued this model will probably continue to be used as a basis for the development of future IMS strategies.

Only the model proposed by Rocha et al. (2007) was elaborated considering the systems approach base, which was also suggested by Karapetrovic and Willborn (1998). In the systems approach, the organization is considered as a single system, in the various areas are derivations of this system adapted to meet the needs and expectations of its stakeholders. The system is top-down viewed, so that top management is the first to commit to the IMS and to make the necessary efforts for the members of the system also identify and commit to the project (JONKER; KARAPETROVIC, 2004).

According to Wilkinson and Dale (1999) the systems approach involves the study of the social and technical elements of the single system. The authors argued that the Karapetrovic and Willborn (1998)’s model does not make it clear how to approach the social elements of the systems approach (e.g organizational culture), focusing only on the technical elements through ISO standards. When analyzing the model proposed by Rocha, Searcy and Karapetrovic (2007) which was based on a systems approach, it was verified that the organizational culture and other social/sustainability issues are more clearly addressed in the 7 principles of the model (stakeholders, resources, leadership, processes, values, objectives and resources). The authors advocate that the model based on the systems approach allows the integration of sustainability in the company's business processes. Although they make it clear that they based the model (and the principles) on the systems approach, there is no information on what was the method that led to the composition of the 7 principles used in the study.

Domingues et al. (2016b) used three axes of elements to compose the base of their maturity model for IMSs. The first axis comprises a set of 21 key process agents, which were first identified in the literature and then validated by two surveys. The second axis approaches the so-called externalities, which are external features that impact the maturity level of the IMS. Four externalities were identified from the literature review: macro ergonomics, life cycle analysis, successful sustainability, and social accountability. The third axis of the model is based on the following eight excellence management pillars: customer focus, leadership, involvement, process approach, systemic approach, continuous improvement, decisions based on evidences and mutual beneficial relationships.

The review presented in this section is in line with the results of Nunhes and Oliveira (2018) in the sense that the integration models is an important research area in IMS. It is under development and began to contemplate sustainability issues, especially in the social pillar.

With respect to the model proposed by Domingues et al. (2016b), although the authors acknowledge the literature review of their study was performed through a theoretical sampling that considered "the topics closely related to the specific topic IMSs", this choice limited the model, since the literature review was restricted to the analysis of only 13 articles.

The theoretical framework and literature reviews conducted in the studies do not cover a complete analysis of the state-of-the-art of IMS, focusing on a few studies, which compromises its use as a basis for the development of models. The academic bases used to develop the models are from IMS-related areas, such as risk management (LABODOVÁ, 2004), management excellence (ASIF et al., 2009; TARÍ; MOLINA-AZORÍN, 2010), etc. Going beyond this finding, we conducted a search to verify the principles of other areas that have been explicitly cited in the IMS literature. The results of this search are shown in Table 21.

Table 21 - Set of principles cited in IMS studies

(continues)

IMS-RELATED PRINCIPLES	CITING STUDIES
Management systems principles	Karapetrovic and Willborn (1998), Labodová (2004), Zeng et al. (2007), Lopez-Fresno (2010), Santos et al. (2011), Rebelo et al. (2014), Luo et al. (2015), Abad et al. (2016), Domingues et al. (2016), Gianni et al. (2017).
Quality management principles	Zeng et al. (2007), Salah and Carretero (2010), Rebelo et al. (2014), Luo et al. (2015), Abad et al. (2016), Gianni et al. (2017)

Table 21 - Set of principles cited in IMS studies

(conclusion)

IMS-RELATED PRINCIPLES	CITING STUDIES
TQM principles	Salah and Carretero (2010), Savino and Batbaatar (2015), Souza and Alves (2018)
Key principles of success for innovative businesses	Fresner and Engelhardt (2004)
Main basic principles of management systems	Sampaio et al. (2012)
Lean and clean principles	Rebelo et al. (2015), Souza and Alves (2018)
Corporate sustainability principles	Gianni et al. (2017)
Corporate social responsibility principles	Leopoulos et al. (2010), Asif et al. (2013), Gianni et al. (2017), Souza and Alves (2018)
EFQM principles	Garengo and Biazzo (2013), Souza and Alves (2018)
Organizational principles	Zwetsloot (1995)
Principles of excellence management	Domingues et al. (2016b)
ISO High Level Structure principles	Majerník et al. (2017)

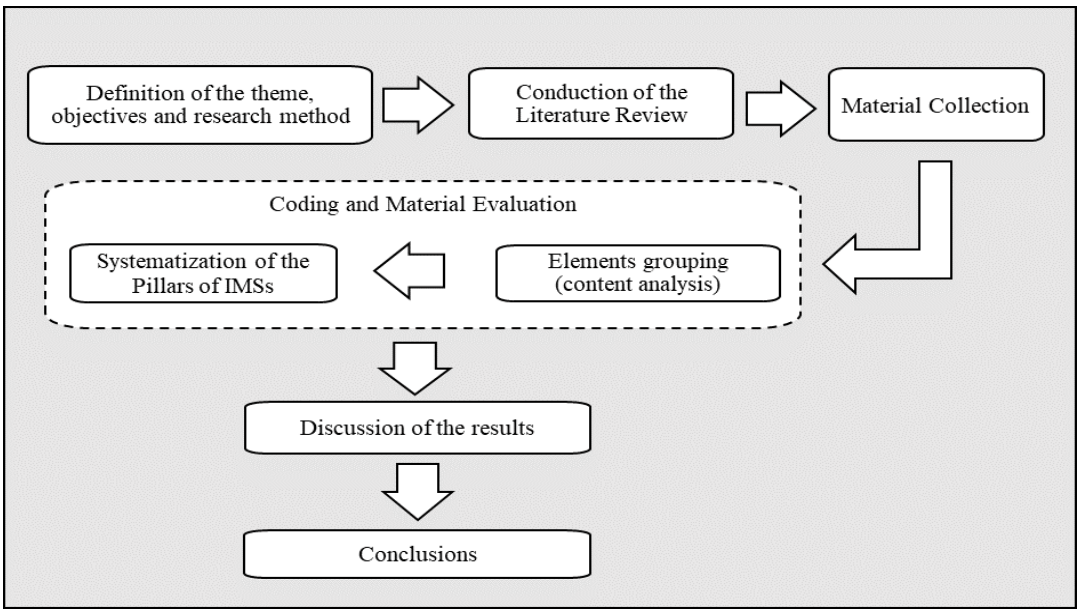
Source: Nunhes, Bernardo and Oliveira (2019).

An analysis of Table 21 shows the important relationship of the IMS areas with other disciplines, whereas makes explicit the lack of specific IMSs principles to assist the development of new studies and the proliferation of the own theory of IMSs in the academic community in a unified way. It is necessary to go beyond the use of the general principles of management or common principles to the MSs. The knowledge of the IMS theory itself should be used to propose its own principles.

5.3 RESEARCH METHOD

This section presents information about the methodological choices used in the study, the classification of the research and its methodological flow. The description of the methodological flow shown in Figure 27.

Figure 27 – Methodological flow IMS Pillars



Source: Nunhes, Bernardo and Oliveira (2019).

The potential of the theme was perceived by means of a search conducted in the Scopus and Web of Science databases (the most important databases in IMS area), from which it was noted that the proposal to systematize the IMS principles had not been explored by means of a content analysis. From this, the authors defined the purpose of the study, which is to establish, through a systematic content analysis and focusing on the 30 most cited articles from 2006 to 2016, the guiding principles of the IMS and the essential elements for its development and maintenance.

– Theme, Objective and Research Method:

The first step to perform the research was the establishment of the key elements needed to prepare the project, such as the definition of the theme in view of its relevance and originality, objective, delimitation and justification. The potential of the theme was perceived by means of a search conducted in the Scopus and Web of Science databases (the most important databases in IMS area), from which it was noted that the proposal to systematize the IMS principles had not been explored by means of a content analysis. From this, the authors defined the purpose of the study, which is to establish, through a systematic content analysis and focusing on the 30 most cited articles from 2006 to 2016, the guiding principles of the IMS and the essential elements for its development and maintenance.

This study was delimited to be theoretical with a qualitative approach. It aims to provide greater familiarity with the problem, explaining scientifically the characteristics of the phenomenon observed (MIGUEL; SOUZA, 2012). The qualitative approach was developed through the systematic content analysis, which is a method widely used in review papers (e.g. MOLDAVSKA; WELO, 2017; PARK; PARK, 2017; XIA et al., 2018). It consists of a systematic reading and classification of material using the codification to identify themes and patterns (MOLDAVSKA; WELO, 2017). Systematic content analysis is used for interpretation of text data, enabling to clarify the reader how the connections between the data and the results were made (ELO et al., 2014). In order to comply with these requirements, the method used to perform the systematic content analysis in this study is presented in this section in detail, giving emphasis to the steps of collection, coding and evaluation of the material to explain how the principles were systematized.

Content analysis can be performed by means of deductive and/or inductive approaches. In the case of deductive approaches categories are assessed based on existing theories, looking for testing hypotheses or principles (BENGTSSON, 2016; SEURING; GOLD, 2012a). This study, however, is in line with the purpose of inductive approaches, through which categories are proposed from the material under examination itself (SEURING; GOLD, 2012a). There is a wide range of methodological possibilities for developing such a study. However, the method of systematic content analysis (inductive) was chosen as more appropriate for this work considering the current fragmentation of the state of state-of-art in IMS. Therefore, the process of systematization of the principles fulfills the requirements of the inductive content analysis because categories were created from raw data, since there are no previous studies dealing with the phenomenon and because the knowledge is fragmented (MOLDAVSKA; WELO, 2017).

There is no "common recipe" to perform inductive content analysis, and for this reason, the reliability of the analysis can be improved from a detailed description of the steps of preparation, organization and assessment of the results (ELO et al., 2014; MOLDAVSKA; WELO, 2017). In this way, we describe here and in the following topics of this section the step-by-step of the study, highlighting the method used to perform the content analysis.

– Literature Review:

The literature review has the purpose of acclimating the reader with the theme IMS and with the proposal of this study. This section begins with the presentation of general and important topics about IMS and then, it focuses on the critical review of the models for IMS

implementation, addressing the principles and bases used to develop them. This step was important to support and justify the subsequent stages of the study.

In order to carry out a trustworthy review of the literature, the most cited articles and also the most recent papers published in journals of relevance in the IMS area were prioritized, such as the TQM Journal, Journal of Cleaner Production, Quality Progress, the Journal of Environmental Management, Environmental Quality Management, among others (NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016).

The most cited articles are those cited in other articles published in journals indexed in the Scopus and Web of Science databases. The criterion of using the most cited articles was adopted considering that they were the most pulverized knowledge in the literature on IMS, being used in the development of the state-of-the-art in this field. Therefore, the most cited articles are relevant sources to be used to provide the reader an acclimatization on the subject approached in the paper.

– Material Collection:

After conducting the literature review, the first stage of the content analysis was developed. It consisted of the collection of material (articles and reviews) used in the systematization of the principles. The search for the articles and reviews was carried out in the Scopus and Web of Science databases on 02 May 2017, using the term "integrated management system*s" and its variations, such as “management system integration”, “integration of management systems”, “management systems” and “integration” in titles, keywords and abstracts. The result was limited to articles published from 2006 to 2016, because it was a period in which the highest number of papers was verified. Another filter used was the document type (articles or reviews only) and the language (English only).

The search with the refinements of the filters resulted in 196 articles in Scopus and 161 in Web of Science. Scott (2006) warns that whenever possible content reviews should include a wide range of relevant sources. Therefore, the 196 and 161 articles of Scopus and Web of Science were ranked in descending order of citations and among them we excluded articles that were out of the scope of the study according to the three researches’ screening with background in IMS. After applying these filters, the 30 most cited in IMS from 2006 to 2016 were selected to compose the portfolio of documents used in the content analysis of this study. Most articles contemplated in the literature review (previous step) were also contemplated in the content analysis because they were in the top 30 most cited articles.

Appendix D presents information on this portfolio. The content analysis method suggests that the main documents of the sample should be selected and effectively analyzed according to a selection criterion. In this study, the 30 most cited articles were the ones that most pulverized their contributions in the literature on IMSs (together they add up to more than 1400 citations). For this reason, the results of these articles had a significant impact on the development of the state-of-the-art of the IMS field. Although the other papers also presented their contributions, they received considerably smaller numbers of citations (at the time of the search, less than 20 citations). This indicates that their results had a smaller impact in terms of effective use in advances in the IMSs field. Therefore, as a matter of feasibility of analysis and focus on the most impactful studies, we decided to select the articles presented in detail in Appendix D.

The articles used in the content analysis are concentrated in certain journals, however, the sample is the result of a general search in which the impact of articles in the IMS area was prioritized in terms of the number of citations. Thus, the articles with the greatest impact considered in this study are those that, independently of the published journal, had a greater importance over the period analyzed in the development of the state of the art of IMS. The journals that contributed most significantly to the portfolio reach a considerable range of readership, which has led to the pulverization of the results in many other journals.

– Coding and Material Evaluation:

The 30 articles in the portfolio were coded with a numeric identifier (from 1 to 30) that represents the identity of an article analyzed. It was performed an initial analysis of these articles selected for content analysis to examine the journal it was published, the number of citations received until May 2017, the research method and the main conclusions.

Content analysis seeks to identify in a document the frequency with which categories of a particular subject are addressed. They may vary from study to study, according to the researcher's assumptions and the nature of the research (SCOTT, 2006). The IMSs elements were identified in the portfolio of articles, and the frequency in which they are cited in the 30 articles was verified (Appendix E).

The literature on content analysis suggests that only the researchers themselves have the ability to understand, analyze and evaluate the results obtained adequately. Otherwise, the inclusion of external participants to the research to verify and analyze the results may threaten its validity. The dialogue between co-researchers is often recommended when it comes to qualitative content analysis (ELO et al., 2014). Considering this, the identification of the

elements was developed with the participation of all the authors of this article, who have great experience in research on IMS.

The identification of the elements was performed in a manual and extremely careful way. The authors first carried out an in-depth reading of the texts, in which they analyzed methodology, main insights, contributions and conclusions of the 30 articles of the portfolio.

Several notes of the articles were taken and interpreted. The development of this stage was led by a researcher with background in content analysis, while the other two researchers (with expertise in research on IMS) focused on performing the analysis of the relevant selected papers. The elements identified by each researcher were discussed in some weekly meetings until the result presented in this work was reached.

Encoding was also used to assist in the representation of IMS elements. At first, the code labels of the elements were extracted directly from the articles. After, the codes which had similar meanings were revised and renamed to become a single element. This process was based on the authors' understanding and experience in order to avoid redundant information. The elements identified in the articles received 28 unique numerical identifiers (from 1 to 28), as can be seen in Appendix E. This encoding was used to reference the articles and the elements in all subsequent analyzes of the study.

Once identified these elements, their cross analysis was carried out to identify how many and which articles have mentioned each element. The elements that had the highest frequencies in the content analysis led to the formation of the principles, while the others were clustered to them. The categories created were named using content-relevant wording. The set of elements was then grouped into categories of principles or pillars, considering their frequency and their content similarities.

The criterion of selecting the elements most cited in the literature to guide the establishment of principles is in line with Scott (2006), Bengtsson (2016) and Vaismoradi, Turunen and Bondas (2013), who advise the creation of groups from the content analysis should consider how often the elements appear. However, as there is no minimum frequency stipulated, we have adopted the threshold of 70% for convenience. Nevertheless, the other elements (with less than 70% of frequency) were not disregarded, but rather allocated in the groups created. The few elements that were kept even though they were not very frequent were those that the authors based on their experiences judged to be important.

The procedure of accounting for the frequency of the elements was necessary for the accomplishment of the content analysis and this punctual analysis does not mischaracterize the main nature of the work, which is primarily qualitative. In order not to limit the conclusions of

the study, the section of results and discussion was developed based on articles present or not present in the portfolio used to systematize the principles and the literature review presented in section 5.2. This choice took into account the need for the discussions of the study to go beyond what is presented in the portfolio of articles. In this way, some studies used in the discussion of the principles may not be in the portfolio. The principles in section 5.4 are the proposed IMSs basis, which may assist in the development of new strategies, methodologies and guidelines for IMSs implementation and use. In the next section of results and discussion the pillars and their systematization are presented in light of the literature and based on the authors' experience.

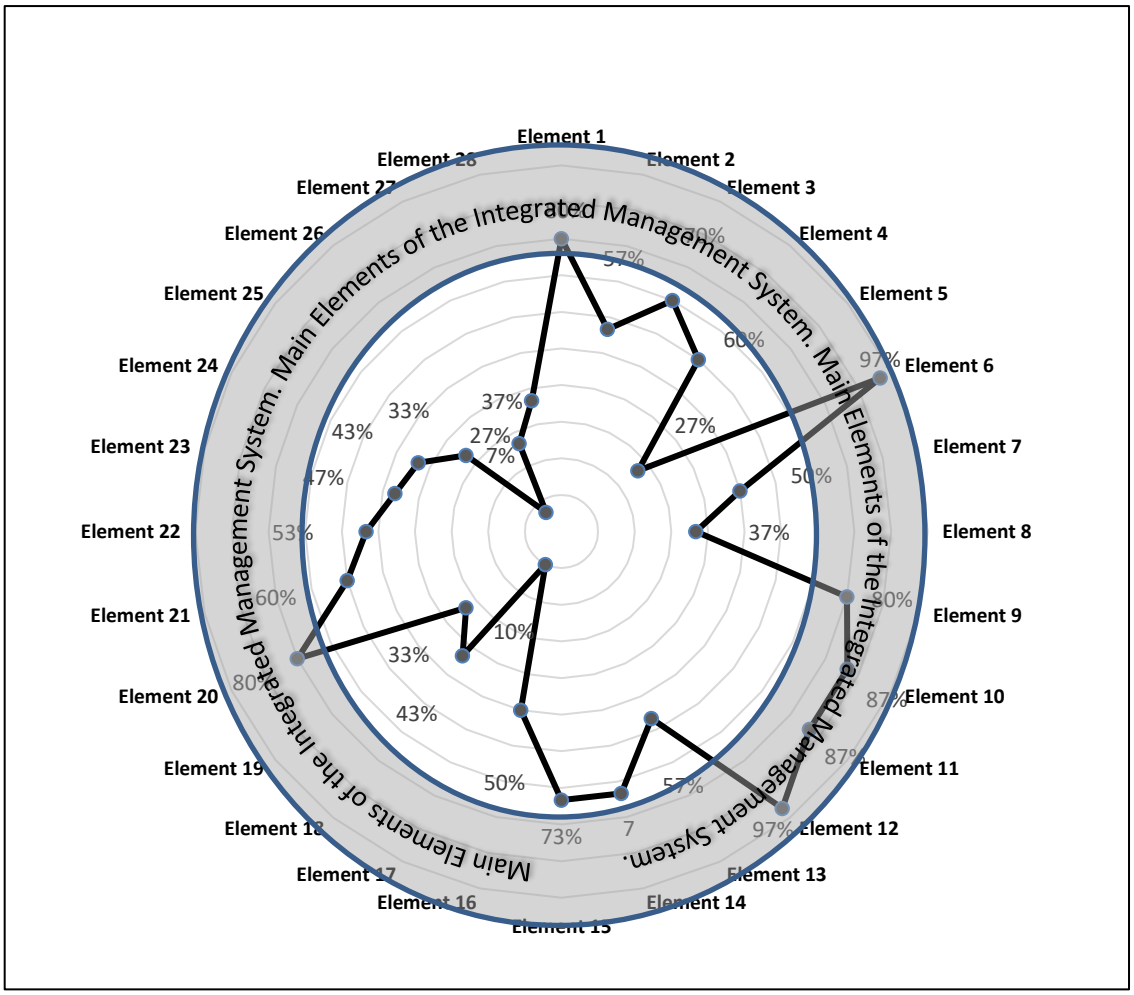
5.4 RESULTS AND DISCUSSIONS

In this section the identification of the IMSs elements and the systematization of its principles are presented. In the sequence, the principles are discussed in view of the content analysis conducted in this study and the existing literature review. The elements address several aspects of IMSs, such as standardization of documents, unification of procedures, integration of responsibilities, communication, training, etc. Some of them, however, occur much more often than others in the articles analyzed, as in the case of element 6, which compared to element 26 appears with a frequency 90% higher (elements 26 and 6 have, respectively 97% and 7% of frequency). These most cited elements are highlighted in Figure 28.

Figure 28 shows the frequencies in which the identified elements are addressed in the articles analyzed. The elements appearing in the highlighted area are more recurring in the portfolio of articles. This means that the elements 1, 3, 6, 9, 10, 11, 12, 14, 15 and 20 are mentioned in at least 70% of the articles, what make them elements essentially important for a good development and maintenance of the IMS.

These elements are the following: 1) Align and / or integrate the responsibilities and authorities of top management and functional management and promote their engagement with the IMS; 3) Manage synergistically and provide human and financial resources to implement and maintain the IMS; 6) Standardize processes; 9) Investing in workforce training; 10) Integrate systems at the strategic level; 11) Integrate systems at the tactical level; 12) Integrate systems at the operational level; 14) Engaging employees in the process of implementing the IMS; 15) Promote the sharing of individual and group-level knowledge and experiences; and 20) Eliminate duplication and inconsistencies between documents, processes and procedures.

Figure 28 - Main elements for implementation and use of IMSs

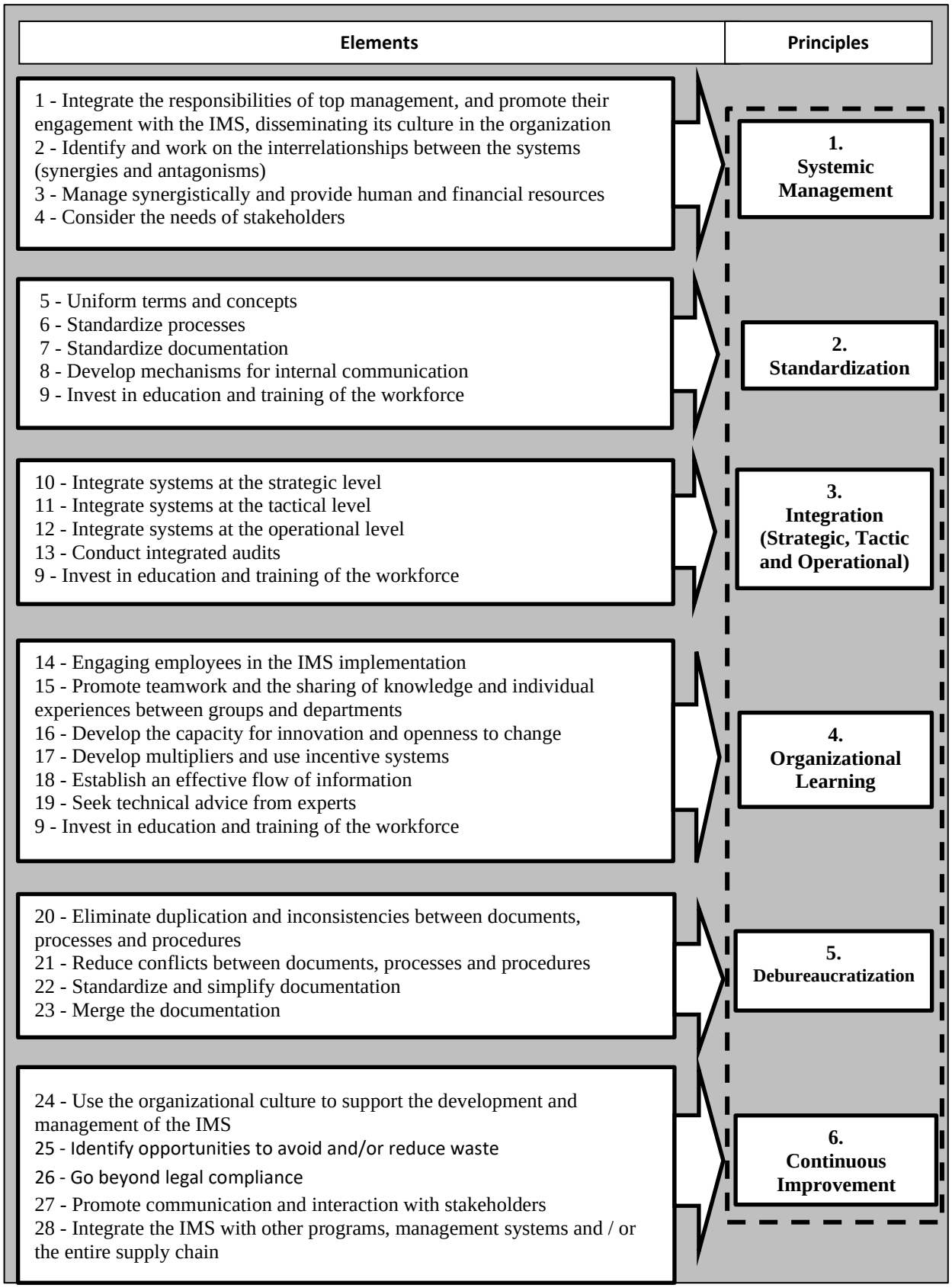


Source: Nunhes, Bernardo and Oliveira (2019).

These "stronger" elements led the elaboration of the principles, while those that did not appear so often in the portfolio were clustered by similarity. The process of grouping the elements and systematizing the principles is presented in Figure 29.

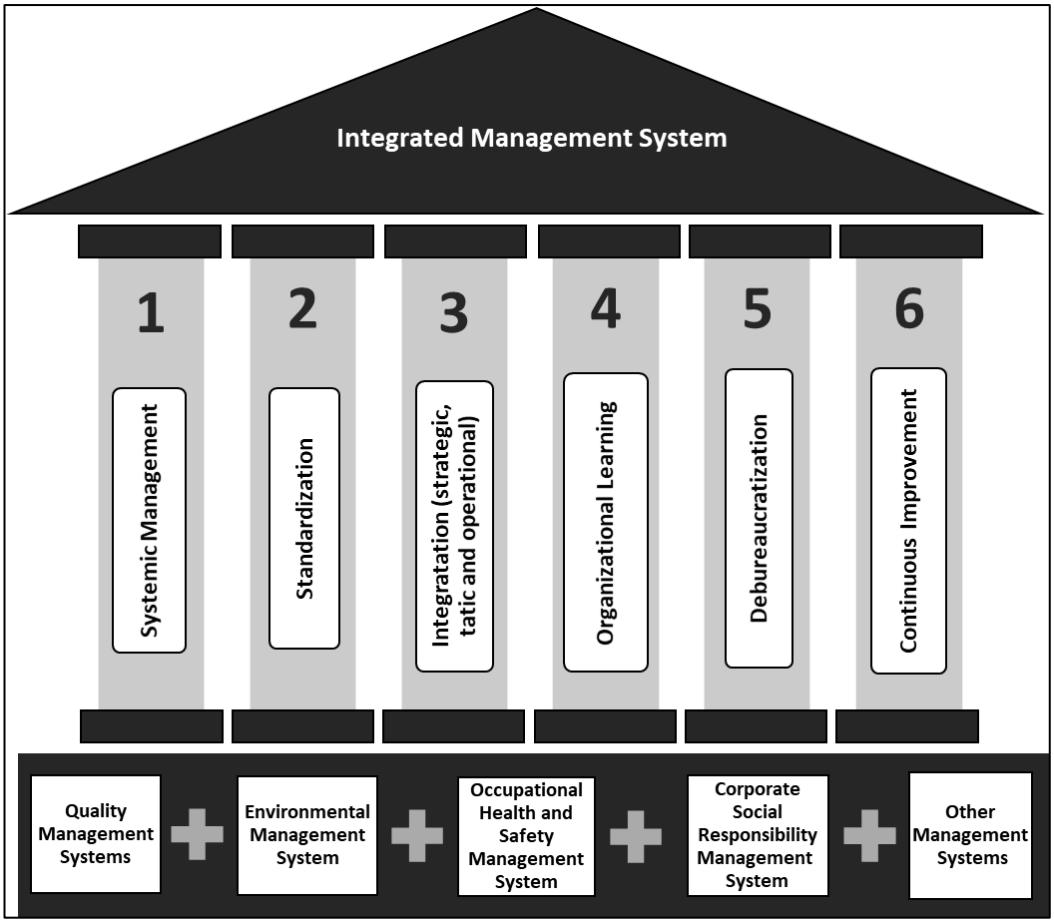
It is observed that through the created principles the IMS can be developed. The principles (Figure 30) should be operationalized by applying the IMS elements to the QMS, EMS, OHSMS, CSRMS, and any other that the organization wishes to integrate. Systemic Management; Standardization; Strategic, tactic and operational integration; Organizational learning, Debureaucratization and Continuous Improvement should be considered in the operationalization of the IMS for a successful integration.

Figure 29 - Systematization of the principles of IMS



Source: Nunhes, Bernardo and Oliveira (2019).

Figure 30 – Principles of IMS



Source: Nunhes, Bernardo and Oliveira (2019).

In addition, in order to use the systemic management, it is necessary to identify and analyze the elements that can be effectively integrated (this issue will be explained in more detail in Pillar 3: integration). In this way, it will be possible to better manage the interrelationships between the systems, that is, to potentialize synergies and to work incompatibilities that exist among the elements of the QMS, EMS, OHSMS, CSRMS, among others.

The identification of the critical factors that involve the development and maintenance of IMSs is important for systemic management. Rebelo et al. (2016) conducted a theoretical and empirical study that identified the existence of 89 CSFs that have influence on the development of IMSs, among which at least 6 must be measured. They are: commitment and leadership; planning; human and financial resources; policy and objectives; information and communication; and satisfaction of internal and external stakeholders.

Regarding this last one, Asif et al. (2013) argue that the integration of MSs should present a structured approach to meeting stakeholder demands in a coherent and synergistic manner.

To this end, the top management must seek to meet the needs of the stakeholders in all subsystems of IMS, by providing a balanced and consistent allocation of resources, tasks and labor to the areas of quality, environment, health and safety, social responsibility, etc., as appropriate.

5.4.1 Pillar 2: Standardization

The standardization achieved from the use of QMSs, EMSs, OHSMSs and CSRMSs has the objective of organizing and standardizing the work processes, so that the expectations of the stakeholders are met in the most efficient way, that is, at the lowest possible cost and variability (ASIF et al., 2010; SU et al., 2015).

By standardizing the QMS, for example, it is possible to reduce the waste of resources and thereby minimize the impact that the disposal would have on the environment. In addition, the standardization obtained with the QMS could also help mitigate possible risks to the worker's health, and the environmental contamination (LLACH et al., 2013; SAVINO; MAZZA, 2014).

Standardization should be applied to documents and processes in order to standardize practices, terms and concepts of all MSs that IMS encompasses (OLIVEIRA, 2013). The standardization of documentation should simplify the execution of the activities of issuing, distribution, disposal and control of documents, making them more objective and minimizing process errors (LOPEZ-FRESNO, 2010; OLIVEIRA, 2013).

To this end, it is recommended to establish a system for creating, updating and controlling the documented information, which may include the use of specific softwares for document management. It is important to note that regardless of the approach used for managing documents, it is advisable to periodically backup the necessary information, and create actions for authorization and access control of employees to documents.

Still regarding document standardization, Oliveira (2013) emphasizes that it is important to simplify the structure of the documents by using graphics, photos and other illustrations; their filling method, making it as objective as possible; and the language used, making it easy to be understood by all who will have access to the document.

The standardization of processes can be developed by elaborating procedures that describe how a given operation or task should be performed. In an IMS, it shall take into account the processes adequacy to internal rules of the organization; requirements of customers; and environmental, occupational health and safety, social responsibility and others requirements, as

applicable (JØRGENSEN, 2008; TARÍ; MOLINA-AZORÍN, 2010). Among the procedures that can be integrated are stand out the document management; corrective and preventive action; prospecting, development and evaluation of suppliers; education and training of the workforce; internal audit; communication; control of monitoring and measuring equipment, etc. (SANTOS et al., 2011).

The pattern should correspond to the best way to perform a given task among the possible options to be put into practice. Therefore, the patterns can be changed whenever a "new way" of performing a task (which is better than the current one) is identified. In this case, if there is a consensus in favor of using the new method, the documents (procedures, work instructions, etc.) should be reviewed, so that the new pattern can be followed by all. Thus, in order to continually improving the patterns used, it is important for employees to be encouraged to identify and communicate opportunities for improvement in their activities, which leads to conclude that, contrary to what many people think, standardization does not limit the creativity of those involved.

The standardization cycle, the SDCA (Standard, Do, Check, Act), can help managers implement the standardization system. In a nutshell, to standardize it is necessary to map the processes and identify the critical activities involved, which will be those that have a significant impact on the final outcome of the process. Thereby, among all the activities of the organization the priority of standardization should be given to those that are critical, that is, that present the most significant operational risks of quality, environment and health and safety.

Once the critical activities have been identified, the operational procedures, which are documents describing how these activities have to be carried out, should be developed. Finally, training should be provided for the employees involved, as well as a periodic monitoring of the standardization process to see if the current pattern is adequate or if revisions are needed.

It should be noted that internal communication and investment in education and training of the labor force is important so that employees are able to use the documents and operate the processes in accordance with the standard set out in the scope of the IMS (TARÍ; MOLINA-AZORÍN, 2010; OLIVEIRA, 2013).

5.4.2 Pillar 3: Integration

The integration of the systems at the strategic, tactical and operational levels is another important pillar to be developed. Bernardo et al. (2009) conducted a study with 435 companies

located in three autonomous communities in Spain. The results showed that the top-down approach is the most commonly approach used for integration.

This means that the integration of MSs generally begins with the integration of more strategic decisions, integrating tactical and operational issues at a later stage (SANTOS et al, 2011). This path to integration has been shown to be effective in the literature of IMS, and therefore its use is recommended.

The integration at the strategic level provides the necessary basis for disseminating the culture and the integration practices at the tactical and operational levels. At the strategic level, it is common to integrate responsibilities, plans, mission, vision, policy, objectives, etc. (TARÍ; MOLINA-AZORÍN, 2010). The need of integrating these elements has already been highlighted in the systemic management pillar.

At the tactical level the goals, indicators, and activities of intermediate level should be integrated in order to monitor and measure the performance from an integrated and standardized perspective (NUNHES et al., 2017). The evolution of the integrated goals and indicators should be disseminated across the sectors, thus making the information on IMS performance available to everyone in the company and supporting decision-making and strategic planning.

To do so, it is recommended the formulation of a systematic for measurement and monitoring of activities and processes that group the existing goals and indicators. For example, suppose a company has three indicators that allow you to evaluate the compliance of your products and services, having one of which measuring compliance with internal quality requirements, another with respect to legal environmental requirements, and so on. If these indicators and goals are grouped, the quality and consistency of the final product conformity assessment can be improved.

Finally, at the operational level one must identify and integrate elements at the level of processes and of the individual. At this level it is essential to define the inputs and outputs of processes, in order to identify who are the customers, and what are the essential processes that can be integrated, etc. As for the elements, at the operational level it is common the integration of work instructions and document control (OLIVEIRA, 2013; NUNHES et al., 2017).

In addition, it is advisable for organizations that want to integrate their MSs to conduct audits and workforce training in an integrated manner, so that employees can be properly integrated with the IMS (BERNARDO et al., 2010; SIMON et al., 2014). With regard to the integrated internal audits, it should be noted that they are more effective as they involve a single audit team, with a single audit plan and a single final report, which may contain specific

nonconformities and improvement opportunities both for each MS and for the IMS as a whole (SIMON et al., 2014).

It is important to plan an internal audit program that establishes the frequency with which they will be conducted, the scope, the selection criteria of auditors ensuring that audits will be carry out with impartially, and ensure that their results are treated by senior management and, if appropriate, corrective actions are taken.

5.4.3 Pillar 4: Organizational Learning

Developing and maintaining the IMS is a process of continuous reconstruction that involves adapting to constant updates and innovations (JØRGENSEN, 2006, 2008). Therefore, it is advisable that the organization develop a learning culture, which could give support to the management of the challenges and complex issues that the internal and external environments present (JØRGENSEN, 2006; SAMPAIO et al., 2012).

The organizational learning pillar represents the need to find ways to facilitate the creation and sharing of knowledge in the IMS. Thus, through the development of learning, it is possible to improve the communication between the top management, employees and stakeholders, as the development of transversal competences favors a greater integration of different levels and areas and, therefore, foster the development a systemic management (SAIDE; MAHENDRAWATHI, 2015).

In order to develop this pillar, it is first suggested to determine the human competencies required for the development of processes, products, services and their integration. Competence is the set of knowledge, skills and attitudes that individuals intend to develop (JACOBS et al., 2013). The human resources area can assist the identification, evaluation and detailing of the core competencies for the activities of the QMS, EMS, OHSMS, CRSMS and of the IMS as a whole (LONGENECKER; FINK, 2013).

In addition, it is necessary to identify the available sources to acquire these competences, which may be, for example, intellectual property, lessons learned from failures and successful projects, workshops, lectures, training, and others (BIEREMA; CALLAHAN, 2014; UBEDA-GARCÍA et al., 2013). The intellectual property involves the granting of patents (inventions, utility models, industrial and design models) or trademarks (industry, service, advertising), by means of which the company can obtain an essential competence.

The promotion of workshops among the quality, environment, health and safety and social responsibility groups can help in integrating the IMS working group through the

exchange of knowledge, experiences, discussion on good practices, code of ethics, etc. Eventually, the workshops can be open to clients, suppliers and community in order to integrate them into the organization, understand them and thereby obtain important information that can be used in the organization's strategic planning.

The lectures can be part of awareness campaigns about, for example, safety on-the-job, everyday issues such as hygiene, safety, food, sexually-transmitted diseases, among others. More generic lectures that stimulate teamwork, idea generation, communication, problem-solving, time use, planning, among other topics can also be taught to all employees, so that a leveling of team knowledge is established about the subject matter, facilitating a common understanding and the adoption of working standards.

Trainings should be conducted to prepare employees to act in the process of IMS implementation. The human resources area may define the necessary trainings for the IMS team and develop a plan to apply them. It is recommended this plan contains interaction dynamics to help to develop, integrate and unite collaborators and teams, which is essential in an IMS (OLIVEIRA, 2013). It is recommended that the results of the training be evaluated and, if necessary, complementary actions be established.

To develop the organizational learning pillar of the IMS, it is important to develop the capacity for innovation in employees, using incentive systems to stimulate suggestions for improvements and seek technical guidance from specialists, who can support the company with an impartial and external view. It is also recommended to develop multiplier employees that know how to adapt the technical language to the public in order to disseminate knowledge, if necessary (ASIF, et al., 2011; BERNARDO, 2014).

5.4.4 Pillar 5: Debureaucratization

The pillar of debureaucratization seeks to combat the excess of bureaucracy by reducing and simplifying processes in the organization. According to management's bureaucracy theory, the organization needs bureaucratic stabilization, efficiency, and quality of compliance structures. Thus, the objective of this pillar is not to eliminate the bureaucracy of the system, but to develop an enabling bureaucracy, that is, to promote the autonomy and empowerment of employees, through the use of documents and procedures as tools to support the work of the employees rather than reinforcing the authority of superiors (ASIF et al., 2010; OLIVEIRA, 2013).

Bureaucracy is indispensable to help employees achieve the desired goals, as it supports them to understand and execute their activities with more efficiency and excellence. However, when the bureaucracy of MSs is not integrated, there is an accumulation of rules, regulations, procedures, manuals, documents and responsibilities which make difficult to perform tasks, decision making, and management as a whole (JØRGENSEN, 2006; TARÍ; MOLINA-AZORÍN, 2010; SANTOS et al., 2011).

In order to develop this pillar, it is necessary to carry out, as mentioned also in the standardization pillar, the mapping of the processes and the identification of the critical activities of each of them. With this, it will be possible to identify wastage of time, material, labor, financial resources, etc. Therefore, it is recommended to analyze carefully the process map in order to identify improvement opportunities that can simplify processes, keeping only the activities, resources and documents that are in fact indispensable.

In general, the debureaucratization of the QMS, EMS, OHSMS and CRSMG can be achieved through the integration of management manuals, processes and procedures; integration of authorities and responsibilities; development of the learning culture, promoting the development and involvement of employees with less dependence on specialization; training for staff adaptation to the IMS culture; and development of systemic management as the basis for systems development.

Many of the problems that generate excessive bureaucracy in MSs are related to infrastructure, documents and activities that do not add value. Thus, it is important that during the development of the IMS these problems be identified, measured and eliminated, otherwise all expected results with integration may be compromised.

5.4.5 Pillar 6: Continuous improvement

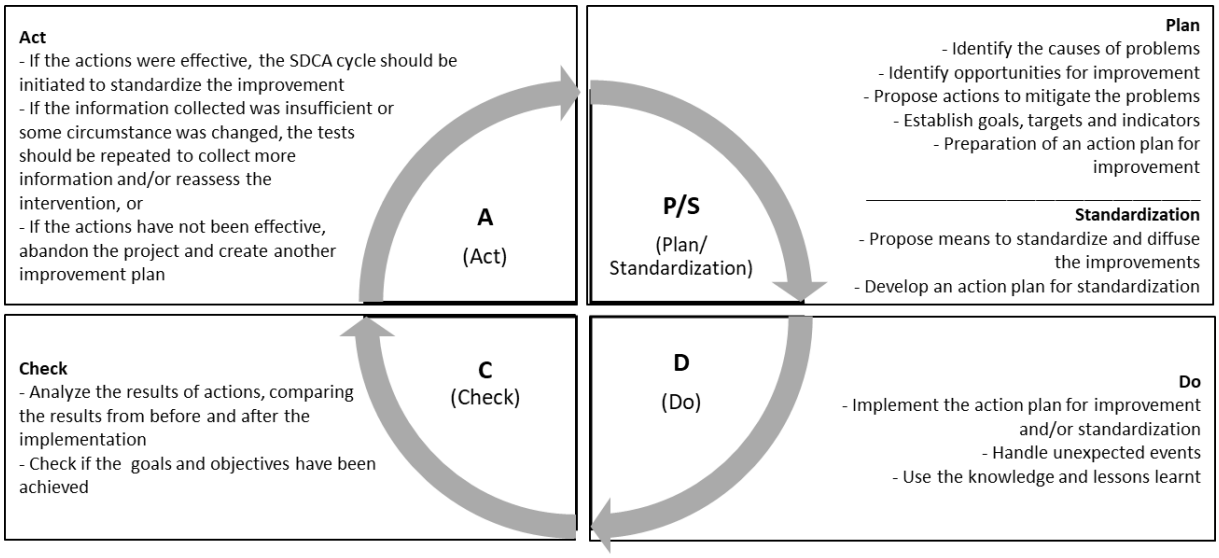
Finally, the continuous improvement pillar should support the development and improvement of the elements of the other IMS pillars. Continuous improvement, or Kaizen, is a set of processes that are developed so that the entire organization seeks improvements in quality, productivity, safety, competitiveness, etc. (JURBURG et al., 2017; LLEO et al., 2017). It should be structured to quickly identify organizational problems and solve them through small steps that, over time, can bring significant improvements to the company (GONZALEZ; MARTINS, 2015; SILVA; MEDEIROS; VIEIRA, 2017).

Continuous improvement should be developed in the company culture, using the processes of identification, analysis and definition of actions and deadlines to solve a given

problem (SOKOVIC; PAVLETIC; PIPAN, 2010). The PDCA cycle (Plan, Do, Check, Act) is a method widely used to develop these improvement routines and generate positive changes (ASIF et al., 2013).

Therefore, it is recommended that managers seek the continuous improvement of the IMS through the creation of an improvement plan based on the PDCA and SDCA cycles. This plan could present a diagnosis of the opportunities for improvement at all levels and processes of the company, describe the actions, resources and goals necessary for its optimization, etc. The SDCA (Standard, Do, Check, Act) cycle will support the standardization and sharing of improvements across the company. In this way, the improvement plan should focus on the standardization of good results, in order to allow to replicate them consistently, thus reducing the variability among the systems and reducing costs and waste (Figure 31).

Figure 31 – Continuous improvement cycle



Source: Nunhes, Bernardo and Oliveira (2019).

As shown in Figure 31, the use of improvement and standardization plans, based on respectively, PDCA and SDCA are important ways to improve the IMS performance. However, it should be noted that the actions that will be part of these plans will vary from company to company, according to the degree of maturity of the IMS in question. It is therefore advisable to carry out a periodic evaluation of the system, seeking to identify the level of maturity of the IMS of the company so that, based on the results of the evaluation a feasible improvement plan is drawn up. Therefore, it is recommended to read (DOMINGUES et al., 2016), which presented

a model for assessing the degree of maturity of IMSs that allows managers to direct their efforts towards the evolution of the system from one level to another, as the case may be.

On the other hand, it is worth emphasizing that the elements that were selected to compose the pillar of continuous improvement characterize "fully integrated" systems, or systems that are "expanding integration", that is, besides integrate QMS, EMS and OHSMS, they integrate other elements, such as cleaner production, sustainability, risk management, supply chain management, etc. In this way, it is expected these elements can support companies to move its IMSs towards excellence, even though generically and regardless of the level in which the IMS is inserted.

Among the elements of this pillar are the use of the organizational culture to support the development of the IMS (JØRGENSEN, 2008; ASIF et al., 2013); identification of opportunities and definition of actions to avoid and/or reduce waste and number of accidents (ASIF et al., 2010; ZENG et al., 2011); investments to improve the system that go beyond legal compliance (JØRGENSEN, 2006; TARÍ; MOLINA-AZORÍN, 2010); exploration of a more intense interaction with stakeholders (JØRGENSEN, 2006; ASIF et al., 2010); and integration of the IMS with other programs, MSs and/or the entire supply chain (JØRGENSEN, 2006; TARÍ; MOLINA-AZORÍN, 2010; ASIF et al., 2009).

The development of the pillar of continuous improvement should be supported by the elements presented in the other pillars. Thus, in order that the organization culture can support the development of IMS actions, it is needed the IMS elements be inserted into the routine activities of the company, and also be communicated by senior management to employees and stakeholders, as previous discussed in pillar 4. In this way, it is expected that the people understand the culture of the organization in which the IMS is inserted; and that it is critical they make an effort to contribute to their real insertion in the work environment. In this sense, it is emphasized that the needs of the IMS should directly influence the development of the companies' competitive strategies, because once the IMS is properly considered by the managers, it will be easier to use the organizational culture to foster IMS development (BARBOSA et al., 2017).

The continuous improvement of the IMS also depends on the development of a lean infrastructure to meet the stakeholders needs, which involves identifying opportunities to avoid and/or reduce waste (JØRGENSEN, 2006). Investing in employee preparedness actions to act in the IMS (pillar 4), for example, can make employees aware about health, safety and environmental issues to the point that they understand the waste of certain hazardous substances can be harmful to their own health, the quality of the final work is related to their well-being

and quality of life at work, etc. In addition, tools and techniques such as Lean Six Sigma, Lean Manufacturing, CP, Enterprise Resource Planning (ERP), Total Productive Maintenance (TPM) and Statistical Quality Control (SQC) can be used to improve product quality and reduce waste and costs (ASIF et al., 2013). It is also worth mentioning that ISO 9001, ISO 14001, OHSAS 18001 and other standards focus on continuous improvement and optimization, which in turn leads to waste reduction (ZENG et al., 2007).

The leap from a "restricted" vision, which is pertinent to a specific MS to a systemic vision, which is pertinent to the IMS can open pathways to innovation and changes, that can involve investments to improve beyond what legal compliance requires, the creation of a more intense interaction with stakeholders, etc.

Thus, it is important for continued improvement of the IMS that it be supported and/or integrated with other programs, MSs, and the entire supply chain. JØRGENSEN et al. (2006) and JØRGENSEN (2008) emphasize that it is important that the focus of the IMS is on the entire production chain, since a more collaborative approach with stakeholders can bring opportunities to improve practices, products and processes, besides allowing to direct and balance the system for sustainability. To this end, it is recommended, according to the reality and need of the company, the integration of IMS with tools and techniques such as CP, Product LCA and Cost of Living, GD, Risk Assessment Sustainability Indicators and Reports, Codes of Conduct, etc. (JØRGENSEN, 2008; Asif et al., 2010; REBELO et al., 2014b).

It should be highlighted that tools inherent to a specific discipline can be applied in other disciplines and for different purposes, as is the case of Quality Function Deployment and Failure Mode and Effects Analysis (QFD), which although came from quality management, can also be used to develop elements of sustainability in the IMS, supporting, for instance, the development of products, and the environmental impact assessment of products and processes.

This last pillar was the only one systematized based on elements that did not have been mentioned in more than 70% of the articles analyzed. However, it was verified that the elements related to the continuous improvement pillar have been presented in the literature more recently, which means that as the research on IMS advances, more elements for its continuous improvement are being explored and new opportunities to innovate are being suggested.

5.5 CONCLUSIONS

The main objective of this research is to establish the guiding principles of IMS and the essential elements for its development and maintenance. This objective was reached through a

systematic content analysis with focus on the most cited articles on IMS from 2006 to 2016. Based on the results obtained, several important conclusions can be highlighted.

First, it was identified the existence of 28 elements for the development and maintenance of the IMS in the portfolio of articles analyzed. Among these, it was verified that some are addressed more frequently than others, which make it possible to conclude that there are elements that are essential to provide a basis for the IMSs. In all, 6 principles of IMS were systematized: 1) Systemic Management; 2) Standardization; 3) Strategic, tactic and operational integration; 4) Organizational learning; 5) Debureaucratization; and 6) Continuous Improvement. Each principle is a result of a grouping of elements by similarity and corresponds to a pillar for development and maintenance of IMS.

The management of an IMS must contemplate the balanced management of the 6 pillars, since they will provide the necessary basis for the system to be developed and maintained in a more homogeneous, consistent and integrated manner. The adequate development of one principle can support the development of others, that is, they are correlated and the poor development of one of them can result in damages that compromise the whole system.

The theoretical contribution of this study is to be a starting point towards the unification of the IMS theory. The results of this paper will open space for dialogue towards the unification of concepts and will help other researchers to develop researches on the subject through the use of these principles in the proposition of models, performance of case studies, surveys, etc. If considered in future studies the principles can help to unify the basis of IMS theory by providing researches with a stronger and more consistent theoretical basis.

Despite focusing on contributing academically, the paper also brings applied contributions. The principles can act as a practical guideline to assist company managers in better target their efforts and allocate resources in the management of the IMS. The guidelines address key points that must be considered by any manager who wishes to implement or who has already implemented an IMS in the company. The results bring about practical examples of actions, practices and tools that can assist the development of the IMS.

The method used in this study has a strong emphasis on the interpretation of written word. The interpretation in turn is influenced by the perceptions of the author's experiences, which limited the results. Therefore, the inclusion of external domain experts in the discussion of the pillars is an opportunity for continuity and improvement of this research. Future studies could investigate the possible relationships between the proposed principles of IMS with the principles of other disciplines, such as ISO 9001: 2015 Quality Management, Human Resources Development, etc. Future researches could also conduct confirmatory studies to identify

characteristics of the IMSs principles empirically. Finally, it is suggested to future studies to develop integration methodologies that contemplate the principles systematized in this study.

6 OPENING NEW PATHS TO CROSS THE BRIDGE BETWEEN SUSTAINABILITY AND INTEGRATED MANAGEMENT SYSTEMS: COMBINED CONTRIBUTIONS FROM ACADEMIA AND IBEROAMERICAN INDUSTRIAL COMPANIES

The paper presented in this chapter is under evaluation in the “Journal of Cleaner Production”.

6.1 INTRODUCTION

Organizations have negative impacts on the most diverse systems that make up the environment and society, and are the result of physical, chemical, biological and human interactions necessary for the delivery of their products and services (OLIVEIRA, 2013). Surrounded by this scenario, companies in several countries have to meet increasingly high social and environmental requirements to contribute to sustainable development (SD) of the planet in the short, medium and long term (CAZERI et al., 2018; PECHANCOVÁ et al., 2019).

The Brundtland Report (Our Common Future) conceptualizes SD as one that meets current needs without compromising the ability of future generations to meet their needs (WCED, 1987). Achieving sustainability, however, is a challenge since most economic activities are unsustainable in view of their considerable impacts on the planet and society (BÜYÜKÖZKAN; KARABULUT, 2018). For example, economic growth at the cost of using energy and raw materials far above the planet's natural capacity to recover has intensified the increase in average global temperature, sea level, ocean acidification, deforestation, soil, water and air pollution, among other negative environmental impacts (SCOTT; MCGILL, 2019).

These impacts are commonly characterized in economic, social and environmental impacts, following the logic of the Triple Bottom Line (TBL), which is one of the most widely used approaches to illustrate and operationalize corporate sustainability (CS). The TBL aims to promote the balanced development of the environmental, social and economic spheres in the organizational environment so that, from this, more sustainable results can be generated (DAWODU; AKINWOLEMIWA; CHESHMEHZANGI, 2017; NUNHES et al., 2021). Faced with this economic reality, companies are being challenged to adopt initiatives that allow them to manage the elements of sustainability and integrate them into their strategies and operations (BASTAS; LIYANAGE, 2019; PECHANCOVÁ et al., 2019).

Nunhes, Bernardo and Oliveira (2020) presented 6 pillars for CS management, being them: corporate sustainability strategy, corporate governance, human resource management,

knowledge and innovation management, measurement, disclosure, and independent assurance, and management systems, and integrated management systems. Management systems (MSs) can contribute significantly to the sustainability management of any type of company, provided that they are implemented in a conscious and efficient manner (DRAGOMIR, 2017; FONSECA; CARVALHO, 2019).

MSs are composed of a set of objectives and procedures for managing a certain element, for example, quality, environment, CS, health and safety of workers, innovation, information security, etc. (PECHANCOVÁ et al., 2019; REBELO; SANTOS; SILVA, 2014c). However, as there is a need to implement an increasing number of management systems to meet the expectations of their stakeholders, many companies have faced problems to keep several MSs separate (NUNHES; MOTTA BARBOSA; DE OLIVEIRA, 2017; RANÄNGEN, 2015). To overcome these difficulties, an efficient management structure, known as Integrated Management System (IMS), began to be used. The IMS most commonly covers the integration of quality management system (QMS), environmental management system (SEM) and occupational health and safety management system (OHSMS). In IMS, there is the integration of several common elements of the MSs - for more details on the most common elements that can be integrated in an IMS it is recommended to read (NUNHES; MOTTA BARBOSA; DE OLIVEIRA, 2017) – which allows achieving greater efficiency in the management of human, technical, material and financial resources to meet the needs of the different stakeholders (DRAGOMIR, 2017; NUNHES; BERNARDO; OLIVEIRA, 2019).

The IMS management structure is composed of 6 pillars, which are: 1) Systemic Management, 2) Standardization; 3) Strategic, tactic and operational integration; 4) Organizational learning; 5) Debureaucratization; and 6) Continuous Improvement (NUNHES; BERNARDO; OLIVEIRA, 2019). The worldwide success of the standards commonly used in the integration of MSs ISO 9001 (quality), ISO 14001 (environment) and OHSAS 18001 (occupational health and safety) - recently replaced with ISO 45001 - coupled with the need to effectively insert and develop the business strategy in the processes and operations of the organization, has fostered the creation of several other management standards and guidelines oriented to different management aspects, such as risks (ISO 31000 guidelines), corporate social responsibility (ISO 26000 guidelines, SA 8000 certification, Global Reporting Initiative guidelines, B Corp certification), innovation (ISO 56002 guidelines), information security (ISO 27001 certification), energy (ISO 50001 certification), etc. (BOIRAL; HENRI, 2017; DRAGOMIR, 2017; ISO, 2020).

Companies that adopt several management standards and guidelines in general have a preference for integrated systems management, as well as greater engagement with the development of CS (DRAGOMIR, 2017; NUNHES; FERREIRA MOTTA; DE OLIVEIRA, 2016; SIVA et al., 2016). They adopt procedures for external verification and audits of their activities and systems, reporting their results publicly through sustainability reports (FONSECA; CARVALHO, 2019). There are three main global frameworks for sustainability reporting: Global Reporting Initiative (GRI) standards, International Integrated Reporting Council (IR) framework, and Sustainability Accounting Standards Board (SASB) guidelines. All these structures are considered globally relevant, but they differ in their purpose: while the GRI seeks communication with various stakeholders, IR focuses on creating shared value between them and the SASB, in turn, prioritizes communication with investors. Of these structures, the GRI standards are the most used for sustainability reporting in the world (KUMAR et al., 2015; LANDRUM; OHSOWSKI, 2018).

The balanced development and management of economic, social and environmental sustainability demands the alignment of CS strategy with management systems so that sustainability can be effectively inserted into all organizational levels (LÜDEKE-FREUND et al., 2018; NUNHES; BERNARDO; OLIVEIRA, 2020). Nunhes and Oliveira (2018) pointed out that the use of IMS for CS development should be explored in future studies. Corroborating the suggestion of Nunhes and Oliveira (2018), Poltronieri, Ganga and Gerolamo (2019) evidenced in Brazilian companies, regardless of their size, that the greater the degree of maturity of IMS, the better the performance in sustainability. According to the authors, the higher the level of integration of IMS, the greater the contribution of MSs to good sustainability performance. Therefore, it is relevant and necessary to continue deepening the study of the interconnection between CS and IMS because the exploration of this relationship has been presenting positive results that confirm the importance of readjusting the management strategies of organizations in favor of sustainable development.

Therefore, as a way to support the development of CS, the structure, processes, indicators, instructions, etc. of IMS can be used (KLUTE-WENIG; REFFLINGHAUS, 2015). In this sense, it is notable that more studies on how to insert sustainability in various organizational levels need to be conducted because, in most cases, the information, elements and practices of the MSs are not yet adequately used to leverage sustainability in organizations, once MS's managers are unaware or do not know about the synergies and benefits that can be achieved through the development of this relationship (WITJES; VERMEULEN; CRAMER, 2017). Given this, it is fundamental that this relationship be thoroughly investigated to propose new

means of approaching CS with IMS (DRAGOMIR, 2017; NUNHES; BERNARDO; OLIVEIRA, 2019). Thus, it will be possible to foster and direct the elaboration of new studies that may bring positive changes in organizations.

Based on this, the research question that guided the development of this work was established: how is it possible to build a bridge between sustainability and IMS aimed at the development of businesses that have positive impacts on society and on the planet? Bearing this in mind, this study aims to propose, based on the cross analysis of 7 case studies in Ibero-American companies and in light of scientific theory, guidelines for the alignment of CS and IMS. This objective was achieved through the identification of synergistic and dissonant elements that can positively or negatively impact the alignment of CS with the IMS, which served as the basis for proposing the guidelines to build a bridge for CS development from the IMS.

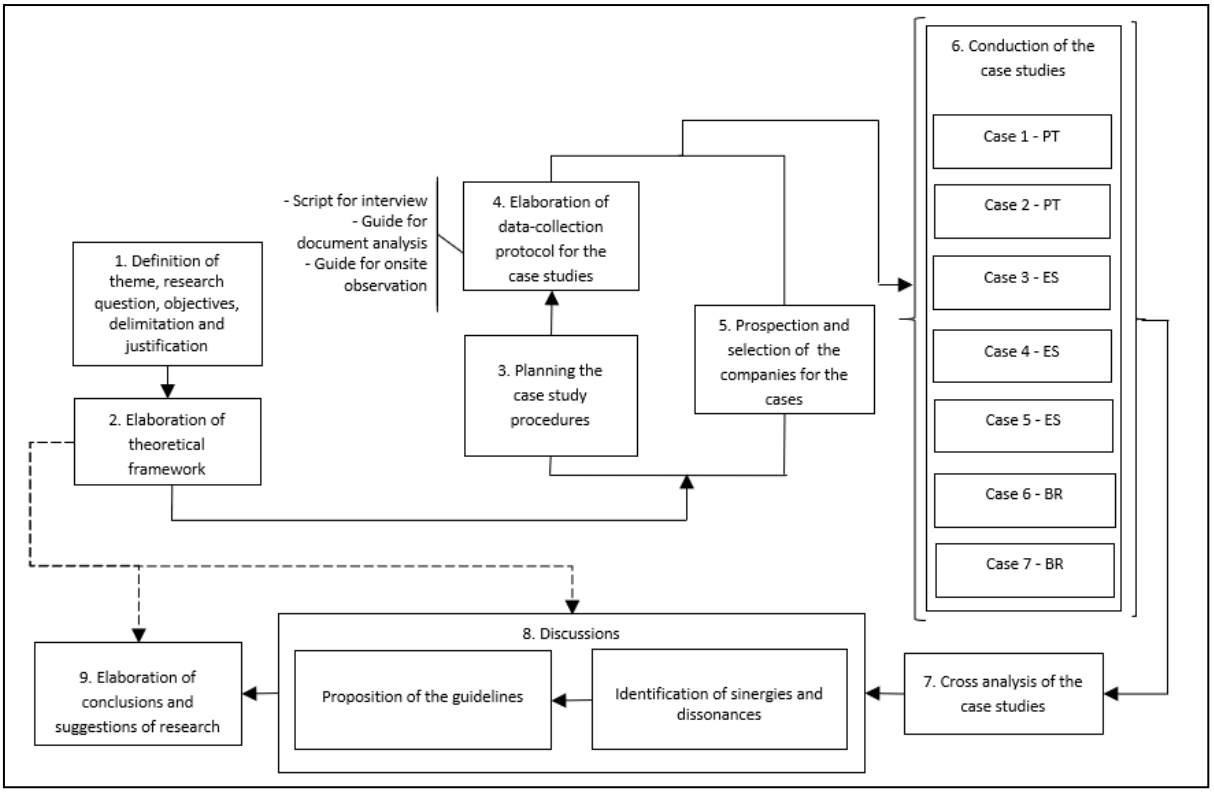
The novelty of this work consists in updating the scientific block of knowledge that unites the themes CS and IMS from a cross-country analysis in Ibero-American companies (Brazil, Portugal and Spain), which allowed the empirical analysis of theoretical results presented in the literature and the addition of new knowledge to the state of the art on the subject.

In the following section, details on the research method used are presented, and in section 6.3 the results and discussions are given. In section 6.3.1 the characterization of the companies studied is performed, in section 6.3.2 synergies and dissonances are identified, and in section 6.4 the guidelines for the alignment of CS with IMS are presented in light of the literature and case studies. Finally, section 6.5 presents the conclusions and suggestions for future research.

6.2 RESEARCH METHOD

The methodological flow according to which this study was developed is shown in Figure 32. Following Figure 32, the first step to perform this research was the establishment of the theme, justification, research question and objectives. These decisions were taken during the initial stage of the study in function of the identification of the scientific relevance of developing the study. After establishing the research project, the theoretical framework (step 2) was developed with a focus on the relationships between IMS and CS.

Figure 32 - Methodological flow of the research



Source: Author (2021).

The planning of the case study procedures (step 3) was developed to ensure the quality of the case study results in the adoption of the following procedures: replication logic in multiple case studies; case study protocol; multiple sources of evidence; draft of the case study reports by key informants; and database for the collected data (YIN, 2015). The adherence of the study to these procedures is explained throughout this section.

The data collection protocol (step 4) for case studies was designed to identify good practices and difficulties in implementing CS and IMS as isolated elements because companies in general are unaware of CS's contributions to IMS and vice versa, although they do exist. The framework of guiding principles of CS (NUNHES; BERNARDO; OLIVEIRA, 2020) and guiding principles of IMS (NUNHES; BERNARDO; OLIVEIRA, 2019) supported the structuring of the data collection protocol of the case studies, which is an important instrument to improve the reliability and validity of the information collected (Miguel and Souza, 2012). Also, based on the references used in the theoretical framework, the synergies and dissonances between IMS and CS were included in the data collection protocol. Appendix F presents the data collection protocol.

Multiple case studies were conducted in companies with outstanding performance in CS. The companies should meet these selection criteria (step 5): be industrial companies with at least two management systems; publish each year a sustainability report, and have operations in Ibero-American countries. According to a study conducted by KPMG (2017), Brazil, Portugal and Spain are part of the "leading the quadrant pack" of companies that most have been publishing sustainability reports for a decade. Hence, the expressive number of companies engaged in sustainable development in these countries, added to the lack of scientific articles focused on sustainability assessment in companies operating in Ibero-American countries, justifies the relevance of choosing Brazil, Portugal and Spain as study variables. More details on the characterization of the studied companies, such as the number of employees and annual average invoicing are presented in section 6.3.1.

For Stravos and Westberg (2009), multiple case studies provide researchers a rich set of data for being a simultaneous work involving multiple sources of evidence and a variety of situations, thus making the study more robust. The purpose of conducting multiple case studies (step 6) was to identify how the main practices related to sustainability and IMSs are developed and maintained, what are their characteristics, main difficulties and how they could relate to each other.

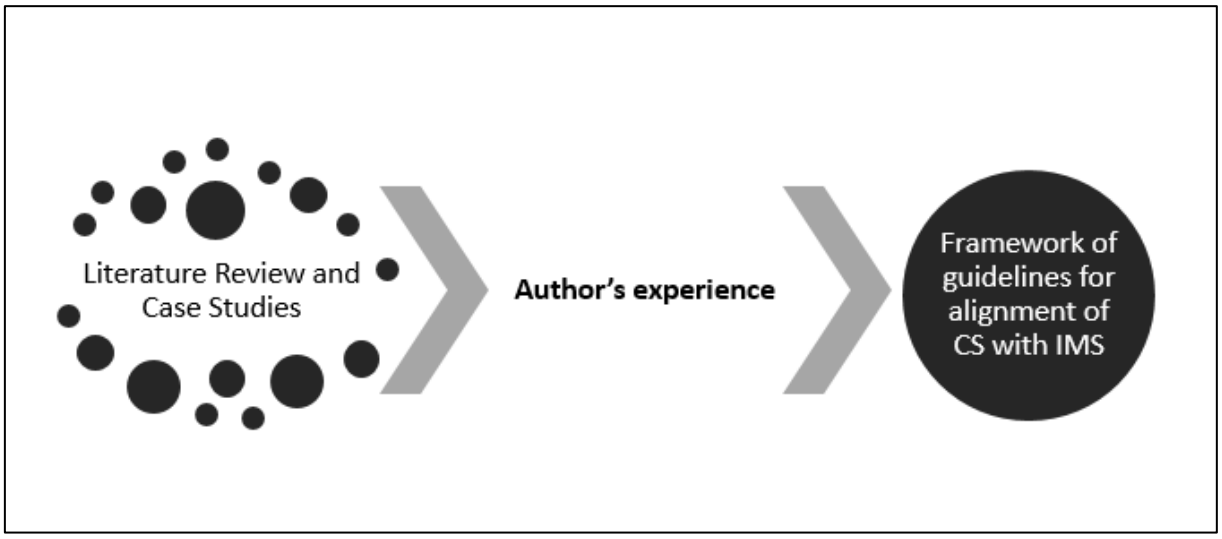
The analysis of documents, on-site observation and interviews was used as sources of simultaneous evidence to collect data in the companies, triangulating the information obtained in order to support a solid interpretation of the reality studied (YIN, 2015). In this phase, documents related to IMSs and sustainability were analyzed, such as sustainability reports; manuals, policies and procedures for the areas of environment, quality, occupational health and safety, R&D, human resources, etc.

Regarding the on-site observation, it was visited the production plants and sectors responsible for IMS and sustainability. In relation to the interviews, they were conducted with those responsible for sustainability and IMS, and, when it was possible, the responsible for the human resources department and, if applicable, the responsible for other separated management systems. In addition to these, in companies A, B, and C some employees below the top management responsible for these departments were also interviewed to better understand the real situation from different points of view. In companies D, E, F, and G, the interviews were conducted remotely via internet due to the COVID-19 pandemic. For this reason, in these cases, priority was given to conducting interviews with key research agents, that is, those responsible for IMS and CS. The data collected in the companies was analyzed in the light of the literature

presented in the data collection protocol and based on the experiences of the authors of this study on the subject.

The cross-analysis of the cases (step 7) aimed to highlight and compare the characteristics and elements of IMS and CS of the companies studied. These applied results allowed to identify and discuss in the light of the scientific literature on CS and IMS the synergies and dissonances in developing and maintain CS and IMS (section 6.3.2). The literature review and the multiple case studies added to the author's experiences based in section 6.4 the proposition of the guidelines to foster the synergies and mitigate dissonances between the elements studied (step 8, see Figure 33).

Figure 33 - Elaboration of the Framework



Source: Author (2021).

Finally, based on all previous results, both theoretical and applied, the conclusions of the paper were drawn up.

6.3 RESULTS AND DISCUSSIONS

This section first presents information about the 7 companies studied (section 6.3.1). Based on the results of the case studies, the synergies and dissonances between the topics studied were identified and verified in the light of the literature (section 6.3.2). The synergies and dissonances supported the proposal for guidelines for aligning CS with IMS (section 6.4).

6.3.1 Characterization of the studied companies

The names of the companies participating in the case studies are not disclosed in order to guarantee their confidentiality. The companies studied were then identified by letters in sequence from A to G. The characterization of each of them is presented in Table 22 and Table 23.

Table 22 - General characterization of the studied companies

Characterization	Company A	Company B	Company C	Company D	Company E	Company F	Company G
Location	Portugal	Portugal	Spain	Spain	Spain	Brazil	Brazil
Group's Annual average invoicing (€)	500 million	300 million	813 million	113 million	87 billion	428 million	84 billion
Number of employees (unit studied)	2000	380	1700	2359	4500	3500	1000
Industrial Segment	Energy and mobility	Paper and pulp	Pharmacy	Food and beverage	Food and beverage	Automotive and industrial supplier	Chemical

Source: Author based on the information obtained in the case studies (2020).

According to OECD (2020), all companies listed in Table 22 can be classified as large because they each employ 250 or more people. Company A is Portuguese and its main activity is to design, develop and supply transformers, equipment and infrastructure management solutions for industrial installations, hydroelectric, thermoelectric, mini hydro and cogeneration plants, wind farms, substations, railway systems, among others. Company A was founded in 1905 in the north of Portugal.

Company B is also located in the north of Portugal, but it has the head office in England. Company B produces corrugated cardboard packaging and the unit studied was founded in 1974. Company C acts in the pharmaceutical segment and was founded in 1929 in Spain, the same location as the unit studied. Its activities cover the entire life cycle of the drug from the discovery and development of new drugs to manufacturing and marketing.

Company D belongs to the food sector and was founded in 1876 in the region of Catalonia and is present in more than 120 countries. Company E is a leading global food company founded in 1866 in Switzerland, is present in 187 countries and was introduced in Spain in 1905.

Headquartered in Germany, company F started its activities in Brazil in 1983. Company F is a manufacturer of automotive, aerospace and industrial components, specifically components and systems in engine, transmission, and chassis applications, rolling and plain bearing. Company G operates in the chemical sector, it is present in Brazil since 1959 and is also headquartered in Germany. Company G has several types of business including petrochemicals, performance materials, monomers, industrial solutions, surface technologies, chemicals and agricultural solutions.

Companies A, C and G started the CS strategy around the 2000s, while companies B, D, E and F formally started in mid-2015. The latter declared that they were influenced by Directive 2014/95/EU, which has been obliging European companies with more than 500 employees since 2017 to account for their non-financial information (environmental, social and governance). All the companies publish their sustainability reports annually following the GRI guidelines. Table 23 presents the management systems that compose the IMS of the studied companies.

Table 23 - Systems that compose the IMS of the studied companies

Company	QMS ISO 9001	EMS ISO 14001/ EMAS	OHSMS OHSAS 18001/ ISO 45001	Energy MS ISO 5001
A	√	√	√	
B	√	√	√	√
C		√	√	
D	√	√		
E	√	√		
F	√	√	√	√
G	√	√	√	√

Source: Author based on the information obtained in the case studies (2020).

As shows Table 23, there are various MSs standards such as ISO 9001, ISO 14001, ISO 45001, etc. forming the basis of the IMS in the companies studied, however, in addition to these MS standards the IMS of each one is customized to meet specific important sector standards according to the nature of the business, for example, the FSC (Forest Stewardship Council) is used in company B and the European Water Stewardship (EWS) in company G. Companies A, D and F keep separated from IMS, respectively, the management system for NP 4457 (Research, Development and Innovation); various food standards; and QMS ISO 9001, IATF 16949 and VDA 6.1 (quality standards for the automotive sector). All companies studied have had IMS developed for at least 6 years.

6.3.2 Synergies and dissonances between CS and IMS: Cross-analyses and discussions

The presentation and discussion of the cross-analysis of the cases follow the structure of the pillars CS (FONSECA; CARVALHO, 2019) and the pillars of IMS (BOIRAL; HENRI, 2017). The case studies allowed identifying 43 synergies and 16 dissonances between CS and IMS, which are presented and discussed in this section in light of the literature. The tables containing the synergies and dissonances can be consulted in the Appendix F of this thesis.

In all companies studied, governance is responsible for defining policies to identify and engage stakeholders. It was observed that companies A, B, D, E, and G have a single committee to jointly address CS and IMS issues at governance board meetings. However, it is up to the board of directors to adhere or not to the systemic and integrated management of resources, without which it is difficult developing sustainable practices (NUNHES; BERNARDO; OLIVEIRA, 2020). All the companies studied have difficulties for using the results of materiality analysis as input for continuous improvement of IMS. In this sense, one of the main dissonant aspects in the alignment of CS with IMS highlighted by companies A, B, and C was the different time perspective adopted for each of them. For the development of the CS, the companies studied tend to focus more on medium and long-term actions, while the IMS development actions are more directed to short and medium-term planning.

Corroborating the findings of (NUNHES; BERNARDO; OLIVEIRA, 2019; TATE; BALS, 2016), all companies agreed that IMS synergically contributes with important information to the definition of the CS strategy. Both the CS manager and the IMS manager constantly monitor the conflicts that arise due to the transversality of these two areas. Another synergistic strategy observed in companies A, B, C, and G is the creation of IMS internal standards to support sustainability integration throughout the organization. For instance, as for IMS, it is possible to standardize criteria, definitions and KPIs for sustainability management (BÜYÜKÖZKAN; KARABULUT, 2018; NUNHES; BERNARDO; OLIVEIRA, 2019).

Companies A, D, F, and G declare to apply IMS best practices in the CS area to simplify and cut red tape in sustainability activities (ASIF et al., 2011). Due to the global crisis that have affected the production of companies C and D, both companies foresee difficulties in balancing the focus between economic recovery and sustainable development. Another synergistic aspect between the themes is the implementation of the CS strategy and IMS, which need the support of top management for their implementation.

HR management has a significant impact on sustainability in companies C, D, and F, since the person responsible for sustainability transmits CS information directly to human resource management, which takes the issues considered relevant for discussion on the board. This makes it difficult to integrate sustainability into the company strategy, which is totally dependent on the approval of the HR sector. The HR team conducts internal campaigns to disseminate topics related to both sustainability and IMS (DELAI; TAKAHASHI, 2013; REBELO; SANTOS; SILVA, 2014c). Although it is a synergic aspect, the trainings are given separately in companies C, D, E, F, and G, not interconnecting the CS projects with IMS and vice versa. All the companies studied showed the predominance of employees of male gender, especially in leadership positions, and that all of them assumed the objective of increasing gender diversity, establishing medium-term goals. In addition, the HR team of company D periodically promotes a meeting point with the company's employees to spread information on all human resource projects.

Companies A, D, E and G develop transversal projects of circular economy and digital transformation. Companies A and D maintain a department of innovation that develops innovation initiatives for the sustainable development of products and processes. Innovation management is kept separate from IMS in these two companies because innovation has its own processes that are not aligned with the IMS processes; nevertheless, in both cases the environmental management area of IMS provides significant support to R&D processes, which in all companies are focused on obtaining environmental improvements to stimulate the circular economy.

The innovation management system of company A and the integrated environment and safety management of company G contributes to the development of the social pillar through the implementation of ideas and technologies that promote the well-being and health of employees (company A) and the value chain (company G).

Companies A, E, F, and G stated that the knowledge achieved with IMS gave full support for the early development of sustainability management, assisting, for example, the creation of audit processes, process and document management, performance evaluation, continuous improvement, etc. On the other hand, companies B, C, and D, informed that there is no integration or sharing of best practices between CS and IMS.

Nevertheless, companies A and F recognize that they should improve the monitoring and measurement of sustainability, as they have currently identified the indicators, but have not defined targets for each of them, which compromises the monitoring and improvement of the sustainability strategy. The sustainability managers of these companies explain that the

definition and monitoring of CS goals depend on the dialog and exchange of information between various corporate and operational areas and that this difficulty reflects the need for greater synergy and integration of sustainability with the different levels and organizational areas. All the companies studied found that the performance evaluation of the IMS itself cannot demonstrate CS performance (BÜYÜKÖZKAN; KARABULUT, 2018).

As previously mentioned, some elements of the business have their own management structure separated from IMS and CS. For example, in addition to the already mentioned examples of A and D companies, which maintain innovation management separate, company D has food safety management separate and company D has quality management separate. IMS makes it possible to create routines to integrate CS into processes through the standardization of terms, tools and processes. All companies highlighted that the revision of ISO standards from 2015 brought an integrative structure for MSs, which contributed to the integration of sustainability in products and processes from a more strategic approach for MSs.

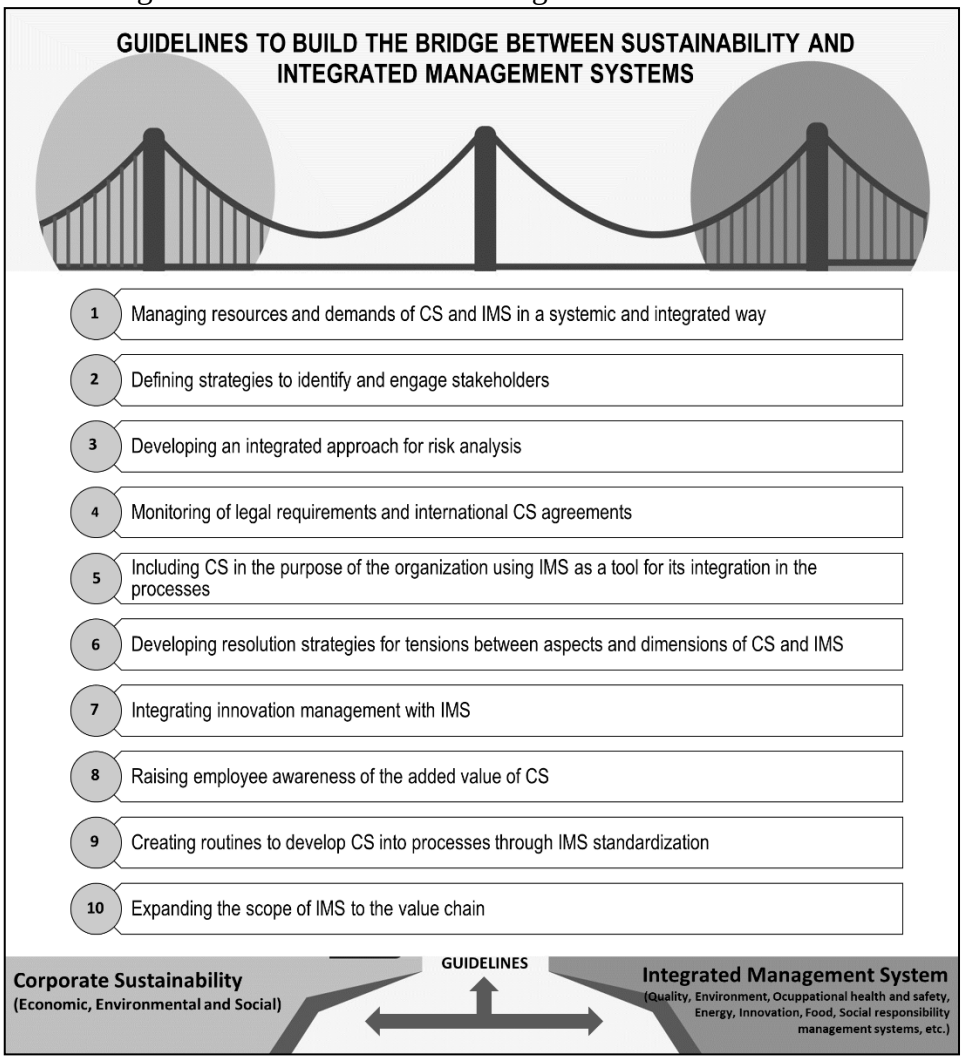
Among the changes related to Annex SL that most impacted sustainability were the analysis of the organization and its context (clause 4.1), understanding of stakeholders' needs and expectations (clause 4.2), emphasis on engaging leadership with MSs (clause 5) and risk-based thinking (clause 6). In ISO 9001 the positive impact of change management (clause 6.3), knowledge management (clause 10) and service outsourcing (clause 11) were highlighted. In ISO 14001, the outstanding contribution to sustainability was the inclusion of the life cycle perspective for products and services, a requirement that all companies agree is quite complex because it involves the mapping and analysis of the entire supply chain.

Finally, the case studies allowed identifying that companies in Spain are generally more advanced in CS than those operating in Portugal and Brazil. Although Portugal and Spain must comply with Directive 2014/95 on the disclosure of socio-environmental performance, the managers of Portuguese companies recognize that the country's legislation regarding environmental impacts is not as advanced as that of other countries in the European economic bloc, which causes them to react more slowly in this respect (EUROPEAN UNION, 2014). Further, although in Brazil companies are not obliged to publish about their socio-environmental performance as in Portugal and Spain, there is a great commitment to do so primarily as a strategy for mitigating the risks that could compromise the sustainability of the business. Thus, the managers of companies F and G highlighted that the inclusion of the management of socio-environmental risks in the strategy of organizations is a factor that has accelerated the development of sustainability in the agenda of Brazilian companies.

6.4 GUIDELINES FOR ALIGNMENT OF SUSTAINABILITY WITH INTEGRATED MANAGEMENT SYSTEMS

As a final result of the discussions, Figure 34 shows the proposition of 10 guidelines to assist the development of CS from IMS. The guidelines were developed on the basis of the synergies and dissonances identified in the literature and verified in the case studies.

Figure 34 - Guidelines for CS alignment with IMS



Source: Author (2021).

6.4.1 Managing resources and demands of CS and IMS in a systemic and integrated way

In line with Ivanova et al. (2014) and Nunhes, Bernardo and Oliveira (2020), it was empirically verified in companies A, B, and D that the lack of engagement of top management and IMS managers with sustainability may be reflected in difficulties in implementing

sustainability in operations due to the unbalanced investments in the economic, social and environmental pillars. For this reason, a greater awareness and dialog on CS is recommended in the organization's transversal areas, among which is IMS. Thus, IMS managers and employees should be directly responsible for the sustainable management of the business, informing the CS manager and top management of decisions and situations that jeopardize the organization's coherence concerning the sustainability strategy and aligning internal and external actions for sustainable business development. It is further recommended that both IMS and CS are fully integrated in decision making (ASIF et al., 2011), To this end, a sustainability committee should be created with the participation of those responsible for the CS and IMS to advise the board of directors on the risks, strategies, impacts and developments of the sustainability strategy in the organization, with emphasis on their impacts on IMS. In this sense, the sustainability committee should value the balanced development of the CS pillars in the IMS (NUNHES; BERNARDO; OLIVEIRA, 2020, 2019). Furthermore, IMS provides comparable historical data to partially evaluate the sustainability performance over the years, as observed in the companies studied. Based on this, an overall performance evaluation is suggested, including the IMS performance evaluation in the CS performance evaluation. This action enables the systemic and balanced management of the organization's resources, which is important for developing both sustainability and the IMS (ISAKSSON; STEIMLE, 2009; SOUZA; ALVES, 2016). Hence, IMS is suggested to act synergistically to improve governance and sustainability processes since its integrated management infrastructure helps increase transparency and decrease distances between areas, as well as to mitigate conflicts between economic, social and environmental interests (NAOMI et al., 2016; SOUZA; ALVES, 2016).

6.4.2 Defining strategies to identify and engage stakeholders with CS

In companies A, B, E, F, and G IMS provides the creation of a collaborative environment with various stakeholder groups, thus the institutionalization of a stakeholder-oriented strategy of sustainability can synergistically receive support from IMS (HAHN, 2012; SOUZA; ALVES, 2016). The employees involved in the IMS activities should be oriented to promote the engagement of the stakeholders closest to their areas of operation with the sustainability strategy of the organization. This process, however, needs to be customized according to the main impacts (positive and negative) that each stakeholder has or may have on the organization and its issues, interests, concerns and expectations. In this way, customized engagement and cooperation actions are recommended for each type of audience, prioritizing stakeholders that

may be adversely impacted by their decisions and activities (SDG COMPASS, 2019). Following the example of companies A, B, C, F, and G, the use of existing communication channels in IMS such as meetings, audits, e-mails, evaluation forms, codes of conduct, etc. is suggested to promote the engagement of stakeholders such as customers, suppliers and employees. These actions, however, do not exclude the need to create communication channels exclusively dedicated to CS, such as a space dedicated to CS on the organization's website, newspaper for employees and sustainability reports (MAAS, 2016; NUNHES; BERNARDO; OLIVEIRA, 2020).

6.4.3 Developing an integrated approach for risk analysis

Identifying and managing current and potential negative and positive impacts related to risks on the sustainable development of the organization in an integrated manner is recommended to sustain the systemic management suggested in the guideline "Manage resources and demands of CS and IMS in a systemic and integrated way." As observed in companies A, E, and G, the IMS manager is recommended to act in partnership with the CS manager in the evaluation of impacts and identification of priorities that will guide the organization's strategy. The process of integrated risk management must have a robust governance structure, composed of committees, policies, norms and procedures, which allows risks to be duly identified, measured, mitigated, followed up and reported (NUNHES; BERNARDO; OLIVEIRA, 2020). This risk analysis must consider the interdependence between economic, environmental and social risks, knowing that eventual failures in any of these dimensions of sustainability may cause losses to others. Corroborating the findings of Lloret (2016), industrial companies have usually focused on controlling environmental risks through the development of resource conservation strategies, for example, waste and energy reduction, which enable them to reduce costs. Faced with this reality, greater attention should be paid to the management of risks related to the social dimension of sustainability, which can generate economic impacts as significant as the environmental ones. The management of social risks is in part included in the occupational health and safety management system, so the IMS can provide partial support in this process. However, several other social aspects transcend the limits of the organization that is not normally contemplated in OHSMS. Therefore, the use of complementary guidelines such as SA8000, ISO 26000, and GRI 400 is recommended for managing risks related to human rights, impacts on society and product liability (NUNHES; BERNARDO; OLIVEIRA, 2020; REBELO; SANTOS; SILVA, 2014c).

6.4.4 Monitoring of legal requirements and international CS agreements

Sustainability must be developed throughout the value chain and, to this end, customers and suppliers at more advanced stages of CS should work in cooperation with their stakeholders, who will increasingly demand compliance with laws and codes of conduct to prevent the occurrence of undesirable events (SOUZA; ALVES, 2016). Companies with more mature IMS are committed to complying with laws and regulations on quality, environment, occupational health and safety, human rights, among others, in addition to being committed to the impacts of their products and services on society (POLTRONIERI; GANGA; GEROLAMO, 2019). Nevertheless, an IMS that contributes to sustainable development should go beyond the adequacy of local, regional and national laws and regulations and should, as far as possible, meet the expectations of sustainable development in countries where its stakeholders operate. As observed in companies F and G, even when operating in countries with more lenient CS legislation, companies must adopt an anticipated posture to comply with laws and agreements in force in the countries where their customers and suppliers operate. This is a way to manage socio-environmental risks that may compromise the sustainability and survival of the organization in the long term. Therefore, the scope of the IMS legal requirements analysis should be expanded to include periodic analysis of laws and CS agreements that impact or may impact not only the organization itself, but also its suppliers and customers.

6.4.5 Including CS in the purpose, mission and vision of the organization using IMS as a tool for its integration in the processes

Motivations for implementing CS and IMS are mainly market-oriented and value-based; that is, the reason for implementation usually arises from an external need to meet the requirements of clients, investors, legislation, etc. (BAUMGARTNER; RAUTER, 2017; BERNARDO et al., 2015). Nevertheless, according to Domingues, Sampaio and Arezes (2015), generally better results can be achieved when the implementation of CS and IMS is driven by internal motivation, that is, when the organization has incorporated in its purpose, mission and vision to act responsibly toward all its stakeholders, as verified in companies A, B, E, F, and G. From this, in line with Nunhes, Bernardo and Oliveira (2020), companies are recommended to rethink the way they do their business, in order to include CS in the corporate agendas defining short, medium and long-term actions for its development. To do so, using IMS in the

operationalization of the CS strategy is recommended, and an initial diagnosis is required to identify the actions already implemented that contribute to CS in IMS and the actions that need to be included in the system.

6.4.6 Developing resolution strategies for tensions between CS and IMS

The use of the synergistic relations between IMS and CS presented throughout this study requires the alignment of the strategic planning of these two elements. As observed in all companies studied, the multifaceted nature of the CS and IMS can generate tensions between structures, processes, objectives and responsibilities, which need to be adequately evaluated and addressed to support the alignment of IMS with the CS. The guidance given previously regarding systemic management in the guideline "Manage resources and demands of CS and IMS in a systemic and integrated way", mainly the creation of the CS and IMS committee, can help resolve these tensions. However, the first step in managing these tensions is to recognize that they exist and understand why they exist. Once this is done, means must be proposed to make the paradox a manageable situation that satisfactorily meets both sides (HAHN et al., 2015). For example, in the companies studied the IMS planning contemplates in its majority short and medium-term actions, which diverge from some CS goals that are inevitably fixed for long-term achievement. Therefore, the compatibility of the time horizon for the achievement of IMS and CS objectives and goals is recommended not only to promote alignment itself, but also the continuous improvement of IMS.

6.4.7 Integrating innovation management with IMS

As mentioned throughout this work, elements that impact the CS must be included in the IMS. Innovation is one of these elements and therefore its integration with IMS is recommended (BERNARDO, 2014; HERNANDEZ-VIVANCO; BERNARDO; CRUZ-CÁZARES, 2018). Continuous innovation is essential for organizations to produce value, remain competitive and be able to respond to increasingly dynamic and demanding markets (NICOLĂESCU; ALPOPI; ZAHARIA, 2015; TYAGI et al., 2015). The alignment of IMS with the CS can be understood as a proposal of incremental innovation, in which IMS helps to gradually promote the exchange of experiences between employees for a more sustainable management (HOLM; VUORISALO; SAMMALISTO, 2014). The companies that presented innovation management processes with the highest degree of maturity were A, D, E, and G. Following the example of

these companies, investments in innovation are suggested for the sustainable development of products and processes, inserting innovation for sustainability in projects of circular economy and digital transformation. The IMS should help this process by giving direct inputs from production processes, customers and suppliers so that the management of innovation is guided by real needs of the organization (HERNANDEZ-VIVANCO; BERNARDO; CRUZ-CÁZARES, 2018). The IMS environmental management area, for example, can provide significant support to R&D processes to obtain environmental improvements to enable circular economy, as observed in company A. The integrated management of health and safety at work may contribute to the development of the social dimension from the implementation of technologies that promote the well-being and health of employees (company A) and customers (company G). Finally, the creation of idea management programs is recommended so that employees from different levels and areas can identify opportunities for continuous improvement and sharing of best practices between CS and IMS (ISAKSSON; STEIMLE, 2009; LUO; LI; LI, 2015).

6.4.8 Raising employee awareness of the added value of CS

The development and satisfaction of people are fundamental factors for the sustainability of the company because the execution of the strategy depends on them. Thus, the development of CS elements from IMS in organizational and decision processes (e.g., in descriptions of functional specifications, criteria for selecting suppliers, eco-design principles) depends, before anything, on the internal acceptance of the employees that CS is an indispensable added value for the perenniality of the organization. The incorporation of the CS in the tasks and routines of the IMS collaborators makes it necessary to awaken in these people an awareness of the importance of the sustainability strategy, highlighting the responsibilities and contributions of each one to achieve good results. Those responsible for human resource management are recommended to conduct trainings, internal campaigns and events to raise awareness and train employees about sustainability. In addition, following the example of companies A and G, an annual internal climate assessment is recommended to measure employee satisfaction with strategic issues, including sustainability. Feedbacks from climate assessment should result in actions to improve the worst evaluated elements. Therefore, the institutionalization of CS should be dynamic and humane, allowing the interaction and contribution of IMS employees to feel part of the process. The sustainability and IMS committee should be open to answer questions that may arise about the relations of employees with elements, structures and routines

of CS (ASIF et al., 2009). In addition to the committee itself, working groups may be assigned with the responsibility of spraying CS values into the IMS and organization as a whole, as observed in companies A, E, and G.

6.4.9 Creating routines to develop CS into processes through IMS standardization

The SDCA cycle (Standard, Do, Check, Act) assists in standardizing good IMS results to allow their consistent replication, thus reducing variability between systems and reducing costs and waste (NUNHES; BERNARDO; OLIVEIRA, 2019). The use of the SDCA cycle can assist the development of CS by making the planned changes using IMS structures and routines (ASIF et al., 2009; NUNHES; BERNARDO; OLIVEIRA, 2019). The knowledge obtained using IMS should give full support to the initial development of sustainability management, assisting, for example, the creation of audit processes, process and document management, performance evaluation, continuous improvement, etc., as observed in companies A, E, F, and G. Therefore, for the development of CS activities at the tactical and operational levels, the creation of "Standard works" is suggested, as well as a lean initiative of task standardization to transmit, in a clear and consistent way, the best practices of IMS execution that can support CS. With this, one expects to obtain a better use of experiences, reduce possible errors and stabilize the CS processes. As observed in company A, the "work standards" represent the know-how acquired over time by the organization, being the basis for all improvement processes, such as the alignment of IMS with CS.

6.4.10 Expanding the scope of IMS to the value chain

The next steps of IMS as a sustainability developer are recommended to manage the socio-environmental aspects beyond the company's internal boundaries through its integration with the value chain. IMS processes should be designed from the perspective of a circular economy to meet the various sustainability requirements defined by the organization as observed in companies A, B, D, E, and G. In this way, IMS should operate the transversal development of sustainability elements (see details in Nunhes, Bernardo and Oliveira, 2020) through its integration with commonly integrable elements such as high management responsibility, work instructions, control of documents and records, internal communication and structure and accountability (NUNHES; MOTTA BARBOSA; DE OLIVEIRA, 2017). The guidelines of this study address the alignment of these and other elements of IMS with CS along

the value chain and in a life cycle perspective (TODARO et al., 2019). Namely, guideline 4.1 provides guidance for the alignment of the high management responsibility element, guideline 4.9 addresses the alignment of routine elements such as document management, and guidelines 4.1 and 4.2 deal with the alignment of internal communication, structure and accountability.

6.5 CONCLUSIONS

The objective of this research was achieved through the identification of synergistic and dissonant aspects between the two themes verified in the literature and in 7 case studies in Ibero-American companies, which enabled the proposition of the guidelines for aligning CS with IMS. The achievement of this objective was only possible through the conceptual contribution of the theoretical steps of extensive scientific research in the main databases in the area of Engineering and Management (Scopus and Web of Science), which supported the applied analysis of this knowledge through the execution of multiple case studies in Iberoamerican companies.

The decision to conduct a qualitative research based on the method of multiple case studies allowed access to information that was essential for the elaboration of the guidelines proposed in this work. It was possible, for example, to verify the main characteristics of CS and IMS in large industrial companies, their synergies and dissonances that enhance or hinder the alignment and achievement of better organizational results. The proposed guidelines were devised on the basis of a) the theoretical framework, b) the systematization of the principles of CS and IMS, the theoretical relationships between the principles (synergies and dissonances), c) multiple case studies, which enabled the identification of characteristics, good practices, difficulties, synergies and dissonances regarding the topic studied, and d) in the author's own experience and in the experiences of the advisor, co-advisor, research colleagues, external professors and consultants. Therefore, there is no well-defined frontier on which of these bases specifically contributed to a given guideline and to what degree, therefore, it is a work that considered all sources of knowledge simultaneously.

Throughout this paper synergies and dissonances between sustainability and IMS were presented and discussed, which can occur in several environments of the organization, potentiating or hindering the implementation of frameworks for alignment and integration of these elements. Among the synergies and dissonances identified and analyzed in this work, some specific conclusions should be thoroughly investigated in order to support the development of sustainability from the IMS.

First, both sustainability and IMS should not function as a department, but as a cross-cutting corporate area, with objectives strategically defined by a single committee composed of diverse leaderships. Another important aspect of the alignment strategy of sustainability with IMS is the creation of short, medium and long-term planning in both areas, using synergistic objectives to minimize the potential conflicts. These are the first steps to create a synergistic and integrated path of sustainability with IMS since the strategy of developing sustainability from the IMS will be promoted in the leaderships of the various types of business. Future studies can explore the necessary criteria for creating a transversal corporate area of IMS and sustainability, adapting the complexity of the structure, characteristics of the strategy and focus according to the sector and size of the organizations.

Secondly, the guidelines proposed showed it is possible to use IMS for what would be the main function of sustainability management: to promote the achievement of sustainable development objectives and to channel and report the results regarding economic, social and environmental performance. In line with Landrum and Ohsowski (2018) and Lüdeke-Freund et al. (2018), it is concluded that the IMS with the highest degree of maturity can provide this structure necessary for fulfilling the CS objectives through the joint and coordinated use of resources, referring to the social, economic and environmental dimensions of sustainability simultaneously. The IMS, when well internalized in the companies, that is, when endowed with a certain degree of maturity, helps increase transparency and decrease distances between areas, as well as softening conflicts between interests between economic, social and environmental issues. As it is a cross-country analysis, the importance of creating laws and incentives to mobilize companies to develop sustainability in their businesses and promote it throughout their value chain was realized.

Due to the delimitation established in the project of this research, the present work has as main limitation the study of large companies with operations in Portugal, Brazil and Spain. Therefore, future studies could expand the variables of analysis, including the study of companies operating in other countries, sectors and also small and medium sized companies. Future studies could also use other research methods to validate the results presented, such as statistical and documentary analysis.

7 CONCLUSIONS OF THE THESIS

The execution of this work made it possible to conclude that the forms of economic development are being gradually adapted to achieve a better balance and interconnection with economic and environmental developments. Industrial companies are historically identified as largely responsible for the intense use of natural resources beyond their regeneration capacity; for varieties of pollution, such as water, soil, air and noise pollution; violation of human rights, among other problems that compromise the sustainable development. On the other hand, the development of this work revealed that companies, especially industrial ones, are becoming the main agents of transformation in the process of transition to a sustainable economy.

The bibliometric studies on CS and IMS conducted showed that there is an increasing number of proposals for sustainable management and operations in order to minimize as far as possible the adverse effects of industrial companies on planet's sustainability while increasing their value generation for society and the environment. The bibliometric studies (chapters 2 and 3) are the results related to the achievement of the first specific objective and represent important theoretical contributions of this thesis. These two bibliometric studies about CS and IMS were published in the prestigious international journals "Sustainability" and "Total Quality Management and Business Excellence (https://doi.org/10.3390/su13031429 and 10.1080 /14783363.2018.1471981).

The results for the second specific objective were presented in chapters 4 and 5, which contain the systematization of the pillars and elements of CS and IMS. Literature reviews are fundamentally important to advance the state of the art; however, those published both in IMS and CS until the moment of the development of this study, do not advance the state of the art as a whole. Based on this, it is argued that the systematization of guiding principles for CS and IMS represents a dialogue towards unifying a starting point for researchers and practitioners in their respective fields. The articles of systematization of principles of CS and IMS are two other theoretical contributions of this thesis. One of which was published in the "Journal of Cleaner Production" (https://doi.org/10.1016/j.jclepro.2018.11.066) and the other one in the "Sustainability" journal (https://doi.org/10.3390/su12031177).

The pillars and elements of the CS along with the pillars of IMS supported the cross-analysis of the themes. The crossing of the CS principles with those of the IMS made it possible to identify the relationships (synergies and dissonances) between the CS and IMS. These relationships were verified in the literature (third specific objective) and in the case studies (fourth specific objective). The results referring to the third and fourth specific objectives were

presented in chapter 5. All content produced for the development of the specific objectives, in particular theoretical and applied synergies and dissonances, contributed to the achievement of the main objective of proposing guidelines for aligning the CS with IMS (chapter 5). The achievement of the main objective was only possible through the conceptual contribution of the theoretical steps of extensive scientific research in the main databases in the area of Engineering and Management (Scopus and Web of Science), which supported the applied analysis of this knowledge through the execution of multiple case studies in Iberoamerican companies.

Among the main conclusions, it is highlighted that sustainability and IMS should not function as isolated departments, but as a transversal corporate area, with objectives strategically defined by a single sustainability committee composed of several leaders, among which must be indispensable the leadership of IMS. The IMS with a certain degree of maturity contributes to increasing transparency and reducing distances between areas, as well as equalizing potential conflicts of interest between economic, social and environmental issues, as IMS naturally permeates between these 3 dimensions. However, an important aspect to highlight in order to enable the alignment of sustainability with IMS is the creation of short, medium and long-term planning in both areas, using synergistic objectives to minimize dissonances that may arise because in general the CS has a long-term look, while IMS has a short-medium look.

Further, the results of this study revealed the positive influence of the local culture and laws have in the alignment of CS with IMS. The cross-country analysis of the results showed the importance of creating laws and incentives (such as Directive No. 2014/95 / EU) to mobilize companies to develop sustainability in their businesses and promote it throughout their value chain. Laws and incentives are an important engine to accelerate the implementation of more sustainable chain practices, as customers and suppliers of large companies are under pressure to adapt to the new way of doing business, at the risk of losing market share if they do not demonstrate adherence to the requested socioenvironmental requirements.

This work has contributed scientifically to the updating of the knowledge block on the relations between the IMS and sustainability, which at the beginning of this work was a topic covered timidly in the literature. In this way, the results from this thesis meant important advances, bringing some validations of knowledge of scientific articles in the real context of Ibero-American industrial companies (Portugal, Spain and Brazil), additions and refinements to the state of the art on the subject. Regarding the applied contribution, the results of this work will provide managers with a framework of guidelines to intervene in organizations with structural changes that can make them greener, socially appropriate and more profitable, thus

promoting the achievement of the global sustainable development objectives proposed in the 2030 Agenda.

The delimitation established in the project of this research refers to the main limitation of the study, which focused on analyzing the relationship between CS and IMS in large companies with operations in Portugal, Brazil and Spain. Therefore, future studies may expand the analysis variables, including the study of companies that operate in other countries, sectors and small- and medium-sized companies. Future studies may also use other research methods to validate the results presented, such as statistical and documentary analyzes and other scientific databases in addition to Scopus and Web of Science.

The results obtained with the multiple case studies cannot be generalized, however, they were confronted with the literature in order to subsidize the elaboration of the guidelines. In this process, it was sought a strong foundation of the literature (which has a worldwide reach), so that the proposed guidelines are applicable regardless of policies, cultures and other geographic and economic characteristics.

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APPENDIX A – 30 MOST-CITED ARTICLES CS (1999-2018) BIBLIOMETRICS

(continues)

#	Title	Authors	Year	Journal	Impact Factor (JCR)	Citations
1	Beyond the business case for corporate sustainability	DYLLICK, T.; HOCKERTS, K.	2002	Business Strategy and the Environment	5,355	1162
2	Concepts and definitions of CSR and corporate sustainability: Between agency and communion	VAN MARREWIJK, M.	2003	Journal of Business Ethics	2,917	666
3	Assessing the sustainability performances of industries	LABUSCHAGNE, C.; BRENT, A.C.; VAN ERCK, R.P.G.	2005	Journal of Cleaner Production	5,651	417
4	A comparative literature analysis of definitions for green and sustainable supply chain management	AHI, P.; SEARCY, C.	2013	Journal of Cleaner Production	5,651	378
5	Indicators of sustainable production: Framework and methodology	VELEVA, V.; ELLENBECKER, M.	2001	Journal of Cleaner Production	5,651	376
6	The business case for corporate sustainability: Literature review and research options	SALZMANN, O.; IONESCU-SOMERS, A.M.; STEGER, U.	2005	European Management Journal	2.369	338
7	Conceptualizing a "sustainability business model"	STUBBS, W.; COCKLIN, C.	2008	Organization and Environment	5,049	281
8	Greening Goliaths versus emerging Davids - Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship	HOCKERTS, K., WÜSTENHAGEN, R.	2010	Journal of Business Venturing	6.000	272
9	Corporations, stakeholders and sustainable development I: A theoretical exploration of business-society relations	STEURER, R.; LANGER, M.E.; KONRAD, A.; MARTINUZZI, A.	2005	Journal of Business Ethics	2,917	265
10	Sustainable Value Added - Measuring corporate contributions to sustainability beyond eco-efficiency	FIGGE, F.; HAHN, T.	2004	Ecological Economics	3,895	265
11	The business case for corporate social responsibility: A company-level measurement approach for CSR	WEBER, M.	2008	European Management Journal	2.369	257
12	Business cases for sustainability: The role of business model innovation for corporate sustainability	SCHALTEGGER, S.; LÜDEKE-FREUND, F.; HANSEN, E.G.	2012	International Journal of Innovation and Sustainable Development	-	247

APPENDIX A – 30 MOST-CITED ARTICLES CS (1999-2018) BIBLIOMETRICS

(continues)

#	Title	Authors	Year	Journal	Impact Factor (JCR)	Citations
13	W(h)ither Ecology? The Triple Bottom Line, the Global Reporting Initiative, and Corporate Sustainability Reporting	MILNE, M.J.; GRAY, R.	2013	Journal of Business Ethics	2,917	233
14	Corporate sustainability and organizational culture	LINNENLUECKE, M.K.; GRIFFITHS, A.	2010	Journal of World Business	3.993	223
15	Corporate sustainability and innovation in SMEs: Evidence of themes and activities in practice	BOS-BROUWERS, H.E.J.	2010	Business Strategy and the Environment	5,355	218
16	Corporate social responsibility and corporate sustainability: Separate pasts, common futures	MONTIEL, I.	2008	Organization and Environment	5,049	215
17	The impact of corporate sustainability on organizational processes and performance	ECCLES, R.G.; IOANNOU, I.; SERAFEIM, G.	2014	Management Science	3,544	211
18	Building institutions based on information disclosure: lessons from GRI's sustainability reporting	BROWN, H.S.; DE JONG, M.; LEVY, D.L.	2009	Journal of Cleaner Production	5,651	207
19	Sustainability and stakeholder management: The need for new corporate performance evaluation and reporting systems	PERRINI, F.; TENCATI, A.	2006	Business Strategy and the Environment	5,355	202
20	Corporate sustainability strategies: Sustainability profiles and maturity levels	BAUMGARTNER, R.J.; EBNER, D.;	2010	Sustainable Development	2.750	199
21	Planetary Boundaries: Ecological Foundations for Corporate Sustainability	WHITEMAN, G.; WALKER, B.; PEREGO, P.	2013	Journal of Management Studies	5.329	193
22	An analysis of indicators disclosed in corporate sustainability reports	ROCA, L.C.; SEARCY, C.	2012	Journal of Cleaner Production	5,651	175
23	How to reconcile environmental and economic performance to improve corporate sustainability: Corporate environmental strategies in the European paper industry	WAGNER, M.	2005	Journal of Environmental Management	4,005	171
24	Multiple levels of corporate sustainability	VAN MARREWIJK, M.; WERRE, M	2003	Journal of Business Ethics	2,917	166

APPENDIX A – 30 MOST-CITED ARTICLES CS (1999-2018) BIBLIOMETRICS

(conclusion)

#	Title	Authors	Year	Journal	Impact Factor (JCR)	Citations
25	Cognitive frames in corporate sustainability: Managerial sensemaking with paradoxical and business case frames	HAHN, T.; PREUSS, L.; PINKSE, J.; FIGGE, F.	2014	Academy of Management Review	6,169	159
26	Integrative management of sustainability performance, measurement and reporting	SCHALTEGGER, S.; WAGNER, M.	2006	International Journal of Accounting, Auditing and Performance Evaluation	-	156
27	Can businesses move beyond efficiency? The shift toward effectiveness and equity in the corporate sustainability debate	YOUNG, W.; TILLEY, F.	2006	Business Strategy and the Environment	5,355	154
28	Systems Approach to Corporate Sustainability: A General Management Framework	AZAPAGIC, A.	2003	Process Safety and Environmental Protection	3,441	151
29	Measuring corporate sustainability	ATKINSON, G.	2000	Journal of Environmental Planning and Management	1,594	143
30	Measuring Corporate Environmental Performance: The Trade-Offs of Sustainability Ratings	DELMAS, M.; BLASS, V.D.	2010	Business Strategy and the Environment	5,355	142

APPENDIX B – 30 MOST-CITED ARTICLES CS (2007-2017) PILLARS

(continues)

Nº	Title	Author(s)/Year	Journal/ISSN	Times cited (Scopus March 2018)
1	Corporate Social Responsibility and Corporate Sustainability Separate Pasts, Common Futures	Montiel (2008)	Organization & Environment/ 1086-0266	166
2	Corporate Sustainability and Innovation in SMEs: Evidence of Themes and Activities in Practice	Bos-Brouwers (2010)	Business Strategy and the Environment/ 1099-0836	157
3	Corporate sustainability and organizational culture	Linnenluecke and Griffiths (2010)	Journal of World Business/ 1090-9516	156
4	Business Cases for Sustainability: The Role of Business Model Innovation for Corporate Sustainability	Schaltegger, Lüdecke-Freund and Hansen (2012)	International Journal of Innovation and Sustainable Development/ 1740-8830	152
5	Corporate Sustainability Strategies: Sustainability Profiles and Maturity Levels	Baumgartner and Ebner (2010)	Sustainable Development/ 1099-1719	146
6	W(h)ither Ecology? The Triple Bottom Line, the Global Reporting Initiative, and Corporate Sustainability Reporting	Milne and Gray (2013)	Journal of Business Ethics/ 0167-4544	128
7	An analysis of indicators disclosed in corporate sustainability reports	Roca and Searcy (2012)	Journal of Cleaner Production/ 0959-6526	126
8	Planetary Boundaries: Ecological Foundations for Corporate Sustainability	Whiteman, Walker and Perego (2013)	Journal of Management Studies/ 1467-6486	117
9	The Impact of Corporate Sustainability on Organizational Processes and Performance	Eccles, Ioannou and Serafeim (2014)	Management Science/ 0025-1909	103
10	Corporate Sustainability Reporting: A Study in Disingenuity?	Aras and Crowther (2009)	Journal of Business Ethics/ 0167-4544	102
11	Is Corporate Sustainability a Value Increasing Strategy for Business?	Lo and Sheu (2007)	Corporate Governance An International Review/ 0964-8410	96
12	Governance and sustainability: An investigation into the relationship between corporate governance and corporate sustainability	Aras and Crowther (2008)	Management Decision/ 0025-1747	93

APPENDIX B – 30 MOST-CITED ARTICLES CS (2007-2017) PILLARS

(continues)

Nº	Title	Author(s)/Year	Journal/ISSN	Times cited (Scopus March 2018)
13	Corporate Sustainability Performance Measurement Systems: A Review and Research Agenda	Searcy (2012)	Journal of Business Ethics/ 0167-4544	91
14	Corporate Sustainability Performance and Idiosyncratic Risk: A Global Perspective	Lee (2009)	The Financial Review/ 1540-6288	89
15	The determinants of corporate sustainability performance	Artiach et a. (2010)	Accounting and Finance/ 1467-629X	88
16	The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects	Wagner (2010)	Ecological Economics/ 0921-8009	79
17	Cognitive frames in corporate sustainability: managerial sensemaking with paradoxical and business case frames	Hahn et al. (2014)	Academy of Management Review/0363-7425	77
18	Measuring corporate sustainability management: A data envelopment analysis approach	Lee and Saen (2012)	International Journal of Production Economics/ 0925-5273	71
19	Subcultures and Sustainability Practices: the Impact on Understanding Corporate Sustainability	Linnenluecke, Russell and Griffiths (2009)	Business Strategy and the Environment	70
20	A holistic perspective on corporate sustainability drivers	Lozano (2015)	Corporate Social Responsibility and Environmental Management	66
21	Defining and Measuring Corporate Sustainability: Are We There Yet?	Montiel and Delgado-Ceballos (2014)	Organization & Environment/ 1099-0836	60
22	Tensions in Corporate Sustainability: Towards an Integrative Framework	Hahn et al. (2015)	Journal of Business Ethics/ 0167-4544	57
23	Beyond the Bounded Instrumentality in Current Corporate Sustainability Research: Toward an Inclusive Notion of Profitability	Hahn and Figge (2011)	Journal of Business Ethics/ 0167-4544	57
24	Conceptualising future change in corporate sustainability reporting	Adams and Whelan (2009)	Auditing & Accountability Journal/ 0951-3574	57

APPENDIX B – 30 MOST-CITED ARTICLES CS (2007-2017) PILLARS

(conclusion)

Nº	Title	Author(s)/Year	Journal/ISSN	Times cited (Scopus March 2018)
25	What does GRI-Reporting tell us about Corporate Sustainability?	Isaksson and Steimle (2009)	The TQM Journal/ 1754-2731	56
26	The Relationship Between Sustainable Supply Chain Management, Stakeholder Pressure and Corporate Sustainability Performance	Wolf (2014)	Journal of Business Ethics/ 0167-4544	55
27	Corporate sustainability: an integrative definition and framework to evaluate corporate practice and guide academic research	Amini and Bienstock (2014)	Journal of Cleaner Production	54
28	Instrumental and Integrative Logics in Business Sustainability	Gao and Bansal (2013)	Journal of Business Ethics/ 0167-4544	50
29	Corporate sustainability performance and firm performance research: Literature review and future research agenda	Goyal, Rahman ad Kazmi (2013)	Management Decision/ 0025-1747	49
30	Managing Corporate Sustainability and CSR: A Conceptual Framework Combining Values, Strategies and Instruments Contributing to Sustainable Development	Baumgartner (2014)	Corporate Social Responsibility and Environmental Management/ 1535-3966	48

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
1	Cooperative relationship with stakeholders	x	x	x	x	x		x		x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x	x		x	x	83%
2	Corporate sustainability performance measurement system	x		x	x			x		x	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x		x	x		73%
3	Factory inspections and audits	x	x	x				x		x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x		x	x	73%
4	HR programs	x	x		x	x	x	x		x	x			x			x		x	x	x	x			x	x	x	x		x	x	67%
5	Top management support	x	x	x		x					x							x	x	x		x	x	x		x	x	x	x	x	x	63%
6	Eco-efficiency-oriented measures	x	x		x	x		x	x			x						x	x	x	x	x	x		x	x	x	x		x	x	63%
7	Long-term orientation			x	x	x				x	x	x	x	x				x		x	x	x	x			x	x	x	x	x	x	57%
8	Corporate sustainability report	x			x	x		x		x	x	x	x	x				x	x		x		x	x	x		x					50%
9	Risk management	x	x		x					x	x	x		x	x	x				x		x		x		x		x		x	x	50%

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
10	Business adjustment, improvement or redesign	x		x	x					x				x			x		x	x		x	x			x		x	x		x	47%
11	Integration and balance of social, environmental, and business activities and responsibilities	x	x	x	x	x				x	x						**x**						x				x	x	x		x	43%
12	Sustainability-oriented organizational culture			x	x					x		x							x	x		x	x				x	x	x	x	x	43%
13	Product design aimed to innovation on environmental performance	x	x		x	x		x								x		x			x					x	x	x		x	x	43%
14	Health and safety initiatives	x	x			x		x		x	x	x							x		x				x	x		x				40%
15	Codes of conduct/corporate governance/ethics		x			x					x	x		x									x	x	x	x		x		x	x	40%

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
16	Legal compliance with regulation				x			x		x										x	x	x			x	x	x	x		x		37%
17	Become an organizational changing agent	x	x	x	x			x				x													x	x		x			x	33%
18	Consideration of sustainability issues in purchase	x			x	x		x															x			x	x	x			x	33%
19	Promotion of flexibility, learn and, if necessary, change in processes		x	x	x															x		x					x	x		x	x	33%
20	Transparency in management		x			x				x	x	x		x										x		x		x		x		33%
21	Managerial best practices to promote sustainable supply chain management		x			x				x							x						x			x	x			x	x	30%
22	Philanthropic responsibilities	x	x					x			x	x					x		x						x	x						30%
23	Evaluation of sustainability business effect				x						x	x			x	x				x						x	x		x			30%

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
24	Energy and water saving projects	x						x	x			x													x		x	x		x	x	27%
25	Sustainability indices and guidelines	x	x	x	x						x			x				x									x					27%
26	Minority and diversity programs	x	x					x			x								X		x				x			x				27%
27	Evaluation of company's reputation and brand value				x						x	x								x	x					x				x	x	27%
28	R&D with multidisciplinary innovation project teams		x	x	x	x		x		x	x						x		X		x						x	x		x		27%
29	Co-development with business partners (e.g. suppliers, R&D institutions, universities)		x		x	x														x		x				x	x				x	27%

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
30	Integration of CS with management systems and/or integrated management systems			x									x	x						x							x			x	x	23%
31	Voluntary environmental restoration	x				x		x	x								x		x	x												23%
32	Standards of corporate governance, compliance, ethics													x				x						x	x	x				x	x	23%
33	Reduction of likelihood of environmental accidents	x	x			x						x													x			x				20%
34	Employee well-being initiatives		x							x		x													x	x		x				20%
35	Environmentally and socially superior products and services				x										x			x								x	x				x	20%
36	Multidisciplinary innovation meetings		x		x																	x					x	x			x	20%

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
37	Innovation discussion panel with customers		x		x																	x					x			x	x	20%
38	Strategic partnerships to overcome market barriers and promote new products and services				x					x														x	x	x		x				20%
39	Fluid information exchange		x																			x				x	x			x	x	20%
40	Publicate a corporate sustainability policy	x		x															x							x	x			x		20%
41	Reduction of operations in environmentally sensitive locations	x				x						x											x					x				17%
42	Handling of toxic waste, effluents, used products from customers, plastic residues, paper and others	x	x									x															x	x		x	x	17%

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
43	Development of employee eco-initiatives	x																	x			x						x		x		17%
44	Occupational Health and Safety and Human Rights standards										x			x							x					x		x				17%
45	Products and services with lower energy or maintenance costs for customers	x																			x				x		x			x		17%
46	Stakeholders' ideals and needs					x		x		x	x	x		x										x		x						17%
47	Teamwork and employee empowerment			x													x					x						x				13%
48	Planning market entry or development				x	x																								x	x	13%
49	Use of waste for revenue and re-usable packages to delivery materials				x																x									x	x	13%
50	Process improvements		x			x														x							x					13%

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
51	Open dialogue across management levels and functions		x																			x					x			x		13%
52	Sustainability management system							x									x										x					10%
53	Geographical and marketing segmentation																								x					x	x	10%
54	Integration of ecosystem stewardship into natural resource management practices	x							x								x															10%
55	Recruitment of local employees							x											x												x	10%
56	Promotion and sponsorship of projects geared toward sustainable development	x	x					x																								10%

57	Analysis of the impact of each stakeholder										x			x										x					x	10%

APPENDIX C – ELEMENTS OF CS AND THEIR FREQUENCY OF OCCURRENCE

(conclusion)

#	CS elements	MOST CITED ARTICLES #1 - #10										MOST CITED ARTICLES #11 - #20										MOST CITED ARTICLES #21 - #30										Total %
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	
58	Inspiration from networks, conferences		x		x					x												x										10%
59	Incentives and reward systems		x			x				x																						10%
60	Ethical commitments regarding 2nd and 3rd world countries		x																					x	x							10%

APPENDIX D – THE 30 MOST CITED ARTICLES IN IMSS FROM 2006 TO 2016

(continues)

Nº	MOST CITED ARTICLES	AUTHOR(S)/YEAR	JOURNAL/ISSN	TIMES CITED
1	Integrated management systems – three different levels of integration	Jørgensen *et al.* (2006)	Journal of Cleaner Production/0959-6526	135
2	A synergetic model for implementing an integrated management system: an empirical study in China	Zeng *et al.* (2007)	Journal of Cleaner Production/0959-6526	116
3	Integrated management systems: experiences in Italian organizations	Salomone (2008)	Journal of Cleaner Production/0959-6526	112
4	How integrated are environmental, quality and other standardized management systems? An empirical study	Bernardo *et al.* (2009)	Journal of Cleaner Production/0959-6526	106
5	Implementing environmental with other standardized management systems: Scope, sequence, time and integration	Karapetrovik and Casadesús (2009)	Journal of Cleaner Production/0959-6526	89
6	Towards more sustainable management systems: through life cycle management and integration	Jørgensen (2008)	Journal of Cleaner Production/0959-6526	71
7	An integrated management systems approach to corporate social responsibility	Asif *et al.* (2013)	Journal of Cleaner Production/0959-6526	60
8	Certification and integration of management systems: The experience of Portuguese small and medium enterprises	Santos *et al.* (2011)	Journal of Cleaner Production/0959-6526	58
9	Towards occupational health and safety systems in the construction industry of China	Zeng *et al.* (2008)	Safety Science/0925-7535	49
10	Integration of standardized environmental and quality management systems audits	Simon *et al.* (2011)	Journal of Cleaner Production/0959-6526	46
11	An empirical study on the integration of management system audits	Bernardo *et al.* (2010)	Journal of Cleaner Production/0959-6526	45
12	Integration of quality management and environmental management systems similarities and the role of the EFQM model	Tarí and Molina-Azorín (2010)	The TQM Journal/ 1754-2731	41

APPENDIX D – THE 30 MOST CITED ARTICLES IN IMSS FROM 2006 TO 2016

(continues)

Nº	MOST CITED ARTICLES	AUTHOR(S)/YEAR	JOURNAL/ISSN	TIMES CITED
13	Process embedded design of integrated management systems	Asif *et al.* (2009)	International Journal of Quality and Reliability Management/ 0265-671X	41
14	Do integration difficulties influence management system integration levels?	Bernardo *et al.* (2012)	Journal of Cleaner Production/0959-6526	37
15	Integrated management systems in Indian manufacturing organizations some key findings from an empirical study	Khanna *et al.* (2010)	The TQM Journal/ 1754-2731	34
16	An empirical examination of benefits from implementing integrated management systems (IMS)	Zeng *et al.* (2011)	Total Quality Management and Business Excellence/1478-3371	33
17	Evolution of Integrated Management Systems in Spanish firms	Simon *et al.* (2012)a	Journal of Cleaner Production/0959-6526	31
18	Difficulties and benefits of integrated management systems	Simon *et al.* (2012)b	Industrial Management and Data Systems/ 0263-5577	28
19	Management systems: Integration or addition?	Sampaio *et al.* (2012)	International Journal of Quality and Reliability Management/0265-671X	28
Nº	Most cited articles	Author(s)/Year	Journal/ISSN	Times cited
20	Implementation of an integrated management system in an airline: A case study	López-Fresno (2010)	The TQM Journal/ 1754-2731	28
21	Guidelines for the integration of certifiable management systems in industrial companies	Oliveira (2013)	Journal of Cleaner Production/0959-6526	25
22	An examination of strategies employed for the integration of management systems	Asif *et al.* (2010)a	The TQM Journal/ 1754-2731	25
23	The integration of quality management and continuous improvement methodologies with management systems	Salah *et al.* (2010)	International Journal of Productivity and Quality Management/1746-6474	24
24	Improving environmental performance through integrated management systems (IMS) in the UK	Griffith and Bhutto (2008)	Management of Environmental Quality/1477-7835	24

APPENDIX D – THE 30 MOST CITED ARTICLES IN IMSS FROM 2006 TO 2016

(conclusion)

Nº	MOST CITED ARTICLES	AUTHOR(S)/YEAR	JOURNAL/ISSN	TIMES CITED
25	Use of different sustainability management systems in the hospitality industry. The case of Spanish hotels	Rodríguez-Antón *et al.* (2012)	Journal of Cleaner Production/0959-6526	23
26	Rediscovering performance management: Systems, learning and integration	Brudan (2010)	Measuring Business Excellence/ 1368-3047	22
27	Integration of standardized management systems: Does the implementation order matter?	Bernardo *et al.* (2012)	International Journal of Operations and Production Management/0144-3577	21
28	Integrated management systems: Moving from function to organisation/ decision view	Leopoulos *et al.* (2010)	The TQM Journal/ 1754-2731	20
29	Integration of management systems: A methodology for operational excellence and strategic flexibility	Asif *et al.* (2010)b	Operations Management Research/ 1936-9735	20
30	Better environmental performance: A framework for integrated management systems (IMS)	Griffith and Bhutto (2008)	Management of Environmental Quality/ 1477-7835	20

APPENDIX E – ELEMENTS OF IMSS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	Elements	MOST CITED ARTICLES (2006 - 2016)																														Freq.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1	Align and / or integrate the responsibilities and authorities of top management and functional management and promote their engagement with the IMS	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x			x		x	X	x	24
2	Identify and work on the interrelationships between the systems (synergies and dissonances)	x	x	x		x	x	x							x	x	x	x	x		x		x		x	x		x	x			17
3	Manage synergistically and provide human and financial resources to implement and maintain the IMS	x	x		x	x	x	x		x	x		x	x	x	x	x	x		x	x		x	x		x				X	x	21
4	Consider stakeholders' needs	x	x		x	x	x	x					x	x	x	x				x	x	x	x	x		x			x	x		18
5	Standardize terms and concepts	x	x		x	x	x			x				x						x												8
6	Standardize processes	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	29
7	Standardize documentation	x	x		x		x	x	x	x	x			x		x	x	x		x			x	x						x		15
8	Develop mechanisms for internal communication	x	x							x			x		x	x			x	x	x				x						x	11
9	Investing in workforce training	x	x	x		x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x	x		x	x	x		x		24
10	Integrate systems at the strategic level	x	x	x	x		x	x	x	x		x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	26
11	Integrate systems at the tactical level	x	x	x	x		x	x	x	x		x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	26

APPENDIX E – ELEMENTS OF IMSS AND THEIR FREQUENCY OF OCCURRENCE

(continues)

#	Elements	MOST CITED ARTICLES (2006 - 2016)																														Freq.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
12	Integrate systems at the operacional level	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	29
13	Conduct integrated audits	x	x	x	x				x	x	x	x			x	x	x	x	x	x	x	x	x									17
14	Engaging employees in the process of implementing the IMS	x	x	x		x	x		x	x	x		x	x	x	x		x	x	x	x		x	x		X		x		x	x	22
15	Promote the sharing of individual and group-level knowledge and experiences	x	x	x		x	x	x	x		x		x		x	x		x	x	x	x	x	x	x			x		x	x	x	22
16	Develop capacity for innovation and openness to change	x	x			x	x	x	x	x				x				x				x		x		X	x			x	x	15
17	Develop multipliers and use incentive systems													x						x			x									3
18	Establish an effective flow of information	x	x										x		x	x		x		x	x	x		x	x					x	x	13
19	Seek technical advice from experts		x							x	x			x	x	x		x	x				x			X						10
20	Eliminate duplication and inconsistencies between documents, processes and procedures	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x	x					x	x	24
21	Reduce conflicts between documents, processes and procedures	x	x		x		x	x	x	x	x		x	x		x	x	x		x			x	x	x					x		18
22	Standardize and simplify documentation	x	x		x		x	x	x	x	x			x		x	x	x		x			x	x						x		16
23	Merge the documentation	x	x				x							x	x	x	x	x	x	x	x		x	x						x		14

APPENDIX E – ELEMENTS OF IMSS AND THEIR FREQUENCY OF OCCURRENCE

(conclusion)

#	Elements	MOST CITED ARTICLES (2006 - 2016)																														Freq.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
24	Use organizational culture to support the development of the IMS	x	x				x	x						x	x	x			x	x	x		x	x			x					13
25	Identify opportunities to avoid and/or reduce waste	x	x				x	x		x			x				x							x						x	x	10
26	Go beyond legal compliance	x											x																			2
27	Promote communication and interaction with stakeholders	x	x				x	x					x		x						x	x										8
28	Integrate the IMS with other programs, management systems and/ or the entire supply chain	x				x	x	x					x	x						x			x	x	x				x		11

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

1. ABOUT THE RESEARCH

1.1 TITLE

Guidelines for alignment of sustainability with integrated management systems in industrial companies: an ibero-american contribution

FUNDING AGENCY: São Paulo Research Foundation (FAPESP) - FAPESP (process n. 2016/20160-0)

1.2 OBJECTIVE

To propose recommendations for the Integrated Management System to foster sustainability in industrial companies.

1.3 RESEARCHER

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1.4 ADVISOR AND CO-ADVISOR

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University of Barcelona.

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

1.5 INSTITUTIONAL AFFILIATION

São Paulo State University "Júlio de Mesquita Filho" - UNESP/ Faculty of Engineering of Guaratinguetá - FEG

ADDRESS: Av. Dr. Ariberto Pereira da Cunha, 333- Pedregulho- CEP: 12516410 -Guaratinguetá, SP, Brasil.

DEPARTATMENT: Production Engineering

PHONE: (12) 31232855

TYPE OF RESEARCH: Doctorate

LINE OF RESEARCH: Management and Optimization

2. ABOUT THE COMPANY

COMPANY NAME:

ADDRESS:

INDUSTRIAL SECTOR:

NATIONALITY/FOUNDATION:

BEGINNING OF THE ACTIVITIES IN THE COUNTRY:

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

NUMBER OF EMPLOYEES:

AVERAGE REVENUES:

IDENTIFICATION IN THE RESEARCH: A[ ], B[ ], C[ ], D[ ], E[ ], F[ ]

3. ABOUT THE VISIT

DURATION: Approximately 2 to 3 hours

DATA: START TIME: END TIME:

DATA REGISTRATION FORM: On-site observation in different areas and sectors; interviews with key people working in the IMS and sustainability areas (top management, intermediate and operational management); and analysis of documents (manuals, reports, procedures, records, etc.) according to availability. Questionnaires will not be applied.

3.1 TOPICS TO BE APPROACHED

– INTEGRATED MANAGEMENT SYSTEMS: Systemic management; Standardization; Strategic, tactical and operational integration; Organizational learning; Bureaucracy; Continuous Improvement.

CORPORATE SUSTAINABILITY: Corporate Governance; Sustainability Strategy; Human resource Management; Knowledge and Innovation Management; Management Systems and Integrated Management Systems x Sustainability; Measurement, reporting and assessment of sustainability.

3.2 INTERVIEWED

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

3.2.1 PERSONAL DATA

NAME:

PHONE: E-MAIL:

FORMATION:

3.2.2 PROFESSIONAL DATA

POSITION: ADMISSION DATE:

EXPERIENCE IN THE AREA:

TOP MANAGEMENT [ ], INTERMEDIATE MANAGEMENT [ ], OPERATIONAL [ ]

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

PRINCIPLES IMS	ELEMENTS/CRITICAL SUCCESS FACTORS IDENTIFIED IN LITERATURE	DATA COLLECTION INSTRUMENTS				
		INTERVIEW			ON SITE OBSERVATION	DOCUMENT ANALYSIS
		TOP MANAGEMENT	MIDDLE MANAGEMENT	OPERATIONAL MANAGEMENT		
1- Systemic management	- Integrate the responsibilities of top management, and promote their engagement with the IMS, disseminating its culture in the organization					
	- Identify and work on the interrelationships between the systems (synergies and dissonances)					
	- Manage synergistically and provide human and financial resources					
	- Consider the needs of stakeholders					
2- Standardization	- Uniform terms and concepts					
	- Standardize processes					
	- Standardize documentation					
	- Develop mechanisms for internal communication					
	- Invest in education and training of the workforce					
3 - Strategic, tactical and operational integration	- Integrate systems at the strategic level					
	- Integrate systems at the tactical level					
	- Integrate systems at the operational level					
	- Conduct integrated audits					
	- Invest in education and training of the workforce					

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

PRINCIPLES IMS	ELEMENTS/CRITICAL SUCCESS FACTORS IDENTIFIED IN LITERATURE	DATA COLLECTION INSTRUMENTS				
		INTERVIEW			ON SITE OBSERVATION	DOCUMENT ANALYSIS
		TOP MANAGEMENT	MIDDLE MANAGEMENT	OPERATIONAL MANAGEMENT		
	- Engaging employees in the IMS implementation					
	- Promote teamwork and the sharing of knowledge and individual experiences between groups and departments					
	- Develop the capacity for innovation and openness to change					
	- Develop multipliers and use incentive systems					
	- Establish an effective flow of information					
5- Debureaucratization	- Eliminate duplication and inconsistencies between documents, processes and procedures					
	- Reduce conflicts between documents, processes and procedures					
	- Standardize and simplify documentation					
	- Merge the documentation					
6- Continuous improvement	- Use the organizational culture to support the development and management of the IMS					
	- Identify opportunities to avoid and/or reduce waste					
	- Go beyond legal compliance					
	- Promote communication and interaction with stakeholders					
	- Integrate the IMS with other programs, management systems and / or the entire supply chain					

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

PRINCIPLES CS	ELEMENTS/CRITICAL SUCCESS FACTORS IDENTIFIED IN LITERATURE	DATA COLLECTION INSTRUMENTS				
		INTERVIEW			ON SITE OBSERVATION	DOCUMENT ANALYSIS
		TOP MANAGEMENT	MIDDLE MANAGEMENT	OPERATIONAL MANAGEMENT		
1- Corporate governance	- Cooperative relationship with stakeholders					
	- Top management support					
	- Codes of conduct/corporate governance/ethics					
	- Legal compliance with regulation					
	- Transparency in management					
	- Philanthropic responsibilities					
	- Evaluation of company's reputation and brand value					
	- Publication of a corporate sustainability policy					
	- Promotion and sponsorship of projects geared toward sustainable development					
	- Ethical commitments regarding 2nd and 3rd world countries					
2 - Corporate sustainability strategy	- Long-term orientation					
	- Risk management					
	- Business adjustment, improvement or redesign					
	- Consideration of sustainability issues in purchase					
	- Strategic partnerships to overcome market barriers and promote new products and services					
	- Planning market entry or development					
	- Geographical and marketing segmentation					
3 - Human resources management	- HR programs					
	- Sustainability-oriented organizational culture					
	- Minority and diversity programs					
	- Multidisciplinary innovation meetings					

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

PRINCIPLES CS	ELEMENTS/CRITICAL SUCCESS FACTORS IDENTIFIED IN LITERATURE	DATA COLLECTION INSTRUMENTS			ON SITE OBSERVATION	DOCUMENT ANALYSIS
		INTERVIEW	ON SITE OBSERVATION	DOCUMENT ANALYSIS		
3 - Human resources management						
	- Development of employee eco-initiatives					
	- Teamwork and employee empowerment					
	- Recruitment of local employees					
	- Incentives and reward systems					
4 - Knowledge management/innovation	- Eco-efficiency-oriented measures					
	- Product design aimed to innovation on environmental performance					
	- Promotion of flexibility, learn and, if necessary, change in processes					
	- R&D with multidisciplinary innovation project teams					
	- Co-development with business partners (e.g. suppliers, R&D institutions, universities)					
	- Environmentally and socially superior products and services					
	- Innovation discussion panel with customers					
	- Fluid information exchange					
	- Products and services with lower energy or maintenance costs for customers					
	- Use of waste for revenue and re-usable packages to delivery materials					
	- Open dialogue across management levels and functions					
	- Sustainability management system					
	- Inspiration from networks, conferences					

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(conclusion)

PRINCIPLES CS	ELEMENTS/CRITICAL SUCCESS FACTORS IDENTIFIED IN LITERATURE	DATA COLLECTION INSTRUMENTS			ON SITE OBSERVATION	DOCUMENT ANALYSIS
		INTERVIEW	ON SITE OBSERVATION	DOCUMENT ANALYSIS		
5 - Measurement, disclosure and independent assurance	- Factory inspections and audits					
	- Corporate sustainability report					
	- Evaluation of sustainability business effect					
	- Corporate sustainability performance measurement system					
	- Sustainability indices and guidelines					
	- Standards of corporate governance, compliance, ethics					
	- Analysis of the impact of each stakeholder					
6 - Management systems and integrated management systems	- Integration and balance of social, environmental, and business activities and responsibilities					
	- Health and safety initiatives					
	- Managerial best practices to promote sustainable supply chain management					
	- Energy and water saving projects					
	- Integration of CS with management systems and/or integrated management systems					
	- Voluntary environmental restoration					
	- Reduction of likelihood of environmental accidents					
	- Reduction of operations in environmentally sensitive locations					
	- Handling of toxic waste, effluents, used products from customers, plastic residues, paper and others					
	- Occupational Health and Safety and Human Rights standards					
	- Sustainability management system					

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

Cross-Ref. IMS Pillars	Synergies and Dissonances CS Pillar 1- Sustainable Corporate Governance	Verified in	
		Literature	Case studies
IMS2 Standardization	S1 - The proper functioning and sustainability of the governance system and the IMS depend on the existence of well-defined management structures and procedures (ASIF et al., 2011; SOUZA; ALVES, 2016).	X	All companies
IMS6 Continuous improvement	S2 - It is important to adopt good governance and IMS practices recommended by institutions and external bodies that aim to promote corporate sustainability (REBELO; SANTOS; SILVA, 2015).	X	All companies
IMS6 Continuous improvement	S3 – The sustainability committee has responsibility for monitoring sustainability and IMS performance and accountability (SIVA et al., 2016).	X	A, B, D, E and G
IMS3 Strategic, tactical and operational and IMS4 Organizational learning	S4 - Risk analysis related to business sustainability is an important governance activity that can receive inputs from IMS risk analysis (REBELO; SANTOS; SILVA, 2015).	X	All companies
IMS1 Systemic management	S5 – Both IMS and CS need to be fully integrated in decision making (ASIF et al., 2011), and there may be a single committee to discuss sustainability and IMS issues in the governance meetings.	X	A, B and D
IMS3 Strategic, tactical and operational and IMS6 Continuous improvement	S6 - The governance concerned with sustainability has a compliance system less driven by laws and more driven by internal strategy (PINA; POLO, 2017; SIVA et al., 2016). This internal motivation can contribute to IMS continuous improvement (BERNARDO et al., 2015).	X	A, B, C, E and G
IMS6 Continuous improvement	S7 - IMS supports the organization's accountability via an improved transparency and interaction with various stakeholder groups (HAHN, 2012; JAĎUĎOVÁ et al., 2015).	X	A, B, C, E, F
IMS1 Systemic management and IMS5 Debureaucratization	S8 – Governance conflicts of interest on economic, environmental, and social constraints can jeopardize proper prioritization and allocation of resources for implementing sustainability and IMS business strategies (NUNHES; BERNARDO; OLIVEIRA, 2019) and TBL equilibrium (NAOMI et al., 2016; TATE; BALS, 2016).	X	A, B, C, D and F
IMS1 Systemic management	S9 – Companies face difficulties in critically define the necessary efforts to achieve more sustainable results and this lack of guidance is reflected in the IMS.		A, B, D and F
IMS2 Standardization	S10 - As the IMS, the sustainable governance should follow standardized procedures because standardization enhances transparency and accountability (JOYCE; PAQUIN, 2016; SANTOS; MURMURA; BRAVI, 2017).	X	A, B, C and D

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

Cross-Ref. IMS Pillars	Synergies and Dissonances CS Pillar 2 - Corporate Sustainability Strategy	Verified in	
		Literature	Case studies
IMS1 Systemic management, IMS3 Strategic, tactical and operational and IMS6 Continuous improvement	D1 - The governance body periodically conducts materiality analysis and discusses sustainability topics relevant to the business, however, the results obtained are not directly used as input for improving the IMS. IMS1 Systemic management, IMS3 Strategic, tactical and operational and IMS6 Continuous improvement		All companies
IMS1 Systemic management and IMS3 Strategic, tactical and operational	D2 – There are different perspectives of time for CS and IMS (ORTIZ-DE-MANDOJANA; BANSAL; ARAGÓN-CORREA, 2019; ROCHA; SEARCY; KARAPETROVIC, 2007). IMS1 Systemic management and IMS3 Strategic, tactical and operational	X	A, B, C and F
IMS4 Organizational learning	S11 - Information from IMS can be useful for the strategic planning of CS (ASIF et al., 2011).	X	All companies
IMS1 Systemic management	S12 - CS and IMS need strategies for the management of tensions (NUNHES; BERNARDO; OLIVEIRA, 2019; TATE; BALS, 2016).	X	All companies
IMS1 Systemic management	S13 - Risk management is important for defining the sustainability (WOLF, 2014) and IMS (FERREIRA REBELO; SILVA; SANTOS, 2017) strategies.	X	All companies
IMS3 Strategic, tactical and operational	S14 - Top management should support the development and implementation of sustainability and IMS strategies (ASIF et al., 2011).	X	All companies
IMS1 Systemic management	S15 - The strategic and integrated vision of sustainability and IMS can help combat competing subcultures within the organization (JORGENSEN, 2008; NAOMI et al., 2016).		B, C, D, E and G
IMS2 Standardization and IMS3 Strategic, tactical and operational	S16 – The creation of IMS internal standards could give support to sustainability integration throughout the organization (BÜYÜKÖZKAN; KARABULUT, 2018)	X	A, B, C, F and G
IMS5 Debureaucratization	S17 - IMS best practices can be used to simplify and cut red tape in sustainability activities (ASIF et al., 2011).	X	A, D, F and G

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

Cross-Ref. IMS Pillars	Synergies and Dissonances CS Pillar 3- Sustainable management of Human Resources	Verified in	
		Literature	Case studies
IMS6 Continuous improvement	S18 - The lack of integration of the CS and IMS continuous improvement plans makes it difficult to achieve the strategic objectives		A, B. D and F
IMS1 Systemic management	S19 - Motivations for implementing CS and IMS are mainly market-oriented and value-based (BAUMGARTNER; RAUTER, 2017; BERNARDO et al., 2015)	X	A, B, C, D and F
IMS1 Systemic management	D3 - IMS helps to develop sustainability, but not in a balanced way, as the IMS strategy in general is limited to the internal environment while the sustainability strategy considers both the internal and external environments (SOUZA; ALVES, 2016).		All companies
IMS4 Organizational learning	D4 - Companies don't know how to take advantage of their experience with standardized MSs to strategically integrate CS into their core business processes (ASIF et al., 2011).	X	A, B, C, D and F
IMS1 Systemic management	D5 - IMS usually does not consider product and process life cycle management variables (JORGENSEN, 2008).	X	A, B, C, D and F
IMS4 Organizational learning and IMS6 Continuous improvement	S20 - Human resources are fundamental drivers for CS and IMS performance (KIESNERE; BAUMGARTNER, 2019; SAVINO; BATBAATAR, 2015).	X	All companies
IMS3 Strategic, tactical and operational and IMS4 Organizational learning	S21 - HR team conducts internal campaigns to disseminate topics related to sustainability and IMS (DELAI; TAKAHASHI, 2013; REBELO; SANTOS; SILVA, 2014).	X	A, B, C, D and F
IMS6 Continuous improvement	S22 - It is important for the development of sustainability and IMS that HR management follow laws, recommendations and guidelines for human rights and social responsibility (DELAI; TAKAHASHI, 2013; NUNHES; BERNARDO; OLIVEIRA, 2019).	X	All companies
IMS2 Standardization, IMS4 Organizational learning and IMS5 Debureaucratization	S23 – The company provides education and training for employee empowerment and excellence in CS and IMS activities (ASIF; SEARCY, 2014; DELAI; TAKAHASHI, 2013).	X	All companies
IMS1 Systemic management	S24 - Top management participate in CS and IMS training planning to guarantee that it is in accordance with company's needs (PINA; POLO, 2017; REBELO; SANTOS; SILVA, 2014b).	X	B

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

Cross-Ref. IMS Pillars	Synergies and Dissonances CS Pillar 4- Sustainable Knowledge and Innovation management	Verified in	
		Literature	Case studies
IMS4 Organizational learning	S26 - Sustainability and IMS influences the planning of innovation management activities (FONSECA; CARVALHO, 2019; HOLTON; GLASS; PRICE, 2010).	X	A, B, C and D
IMS6 Continuous improvement and IMS3 Strategic, tactical and operational	S27 - When IMS is flexible it could allow the incorporation of new concepts, products and sustainable technologies in the organization (REBELO; SANTOS; SILVA, 2014c)	X	A, B and C
IMS4 Organizational learning	S28 - IMS promotes greater knowledge sharing among employees, which facilitates the integration of sustainability in the organization (HOLM; VUORISALO; SAMMALISTO, 2014).	X	C and D
IMS4 Organizational learning	S29 - CS and IMS need adaptation to the environment of innovations and constant updates in the needs of stakeholders (HOLM; VUORISALO; SAMMALISTO, 2014; REBELO; SANTOS; SILVA, 2014c).	X	All companies
IMS6 Continuous improvement	S30 - Management idea programs can help identify opportunities for continuous improvement of the existing CS and IMS patterns (ISAKSSON; STEIMLE, 2009; LUO; LI; LI, 2015).	X	A and D
IMS3 Strategic, tactical and operational and IMS4 Organizational learning	S31 - The sustainability culture and values influences IMS and promotes integration (NAOMI et al., 2016; ROCHA; SEARCY; KARAPETROVIC, 2007).	X	C and D
IMS4 Organizational learning	D9 - There is no integration or sharing of best practices between CS and IMS (ISAKSSON; STEIMLE, 2009).	X	B, C and D
IMS1 Systemic management and IMS3 Strategic, tactical and operational	D10 - The innovation management system is usually separated from other management systems, not fully integrated neither with sustainability nor with IMS		All companies

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(continues)

Cross-Ref. IMS Pillars	Synergies and Dissonances CS Pillar 5- Measurement, disclosure and independent assurance of Corporate Sustainability	Verified in	
		Literature	Case studies
IMS2 Standardization	S32 - Standards and recommendations for the development of sustainability (BÜYÜKÖZKAN; KARABULUT, 2018) and IMS (FERREIRA REBELO; SILVA; SANTOS, 2017) are used.	X	All companies
IMS3 Strategic, tactical and operational	S33 - IMS assists in the preparation of the sustainability report that is subject to external verification because it presents a set of performance indicators with minimum requirements in the areas of TBL (ASIF et al., 2011).	X	All companies
IMS2 Standardization, IMS3 Strategic, tactical and operational and IMS4 Organizational learning	S34 - IMS provides comparable historical data for partially assess sustainability performance over the years (ASIF et al., 2011).	X	All companies
IMS3 Strategic, tactical and operational	S35 - IMS auditing is a practice that gives greater confidence to the information disclosed in the sustainability reports (ASIF et al., 2011).	X	All companies
IMS1 Systemic management	S36 - Overall performance is needed to assess both CS and systemic management of IMS (ISAKSSON; STEIMLE, 2009; SOUZA; ALVES, 2016).	X	A, B, C and D
IMS2 Standardization and IMS6 Continuous improvement	S37 – Standardization added to the ability to managing risks and changes can improve CS and IMS performance and transparency (HOLM; VUORISALO; SAMMALISTO, 2014).	X	All companies
IMS6 Continuous improvement	D11 - The performance evaluation of the IMS itself is not able to demonstrate CS performance (BÜYÜKÖZKAN; KARABULUT, 2018)	X	All companies

APPENDIX F – DATA COLLECTION PROTOCOL FOR THE CASE STUDIES

(conclusion)

Cross-Ref. IMS Pillars	Synergies and Dissonances CS Pillar 6- Sustainable Management Systems and Integrated Management Systems	Verified in	
		Literature	Case studies
IMS1 Systemic management	S38 - CS and IMS are focused on meeting the needs and expectations of various stakeholders (HAHN, 2012; JAĎUĎOVÁ et al., 2015).	X	A, B, C and D
IMS2 Standardization and IMS5 Debureaucratization	S39 - IMS makes it possible to create routines to integrate CS into processes through standardization of terms, tools and processes as done in IMS. This can simplify sustainability management (ASIF et al., 2011)	X	A, B, C and D
IMS6 Continuous improvement	S40 - IMS continuous improvement actions can positively impact sustainability and vice-versa (ASIF et al., 2011)	X	A, B, C and D
IMS2 Standardization	S41 - Companies follow international standards and guidelines to develop CS and IMS (ASIF; SEARCY, 2014; SANTOS; MURMURA; BRAVI, 2017)	X	A, B, C and D
IMS3 Strategic, tactical and operational	S42 - CS approaches should consider integration with core business processes such as IMS (SIVA et al., 2016)	X	A, C and D
IMS4 Organizational learning and IMS6 Continuous improvement	S43 - Sustainability learning and innovation is important for IMS continuous improvement (ASIF et al., 2011).	X	A, B, C and D
IMS1 Systemic management and IMS4 Organizational learning	D12 - There is little openness, dialogue and synergy between transversal areas of IMS and CS (DELAI; TAKAHASHI, 2013)	X	A, B, C and D
IMS6 Continuous improvement	D13 - In order for the IMS to contribute to sustainability, it is necessary to go beyond meeting legal requirements and traditional management system standards (PINA; POLO, 2017; REBELO; SANTOS; SILVA, 2014c; SIVA et al., 2016).	X	A, B, C and D
IMS5 Debureaucratization	D14 –Separated management structures for CS and IMS result in overlapping requirements (MUSTAPHA; MANAN; WAN ALWI, 2017).	X	A, B and C
IMS3 Strategic, tactical and operational	D15 - Unlike IMS, sustainability management is a set of disconnected practices (DELAI; TAKAHASHI, 2013).	X	A, B and C
IMS3 Strategic, tactical and operational	D16 - Sustainability objectives are more strategic and IMS objectives are more operational (REBELO; SANTOS; SILVA, 2014c).	X	A, B, C and D