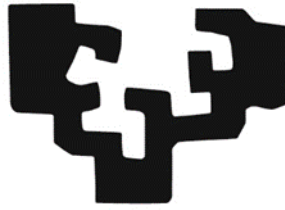


eman ta zabal zazu



Universidad
del País Vasco

Euskal Herriko
Unibertsitatea

Faculty of Engineering in Bilbao

Graphical Design and Project Management

Title

**Business Model for Sustainable Innovation
at Project Level**

Author: María E. Aguilar Fernández

Director: José R. Otegi Olaso

Director: Rikardo Mínguez Gabiña

2019

Table of Contents

I. INTRODUCTION	1
II. LITERATURE REVIEW	4
1. PRELIMINARY LITERATURE REVIEW.....	5
1.1 Findings of preliminary literature review.....	13
1.1.1 Sustainability and Financial performance of corporations.....	14
1.1.2 Sustainability and Project Management	20
2. SYSTEMATIC LITERATURE REVIEW	28
2.1 Selection of papers.....	28
2.2 Results: Inductive approach.....	29
2.2.1 Strategy Drivers.....	66
2.2.2 Management Drivers.....	68
2.2.3 Performance driver	69
2.2.4 Sustainable innovation drivers and their influence in the change of paradigm proposed by Silvius.....	71
2.3 Results: deductive approach	72

3. SUSTAINABLE BUSINESS MODEL INNOVATION.....	78
4. PROJECT MANAGEMENT AND SUSTAINABLE DEVELOPMENT ..	92
4.1 Sustainable project management: a tool for the transition to a sustainable business model	101
5. FROM PROJECT BUSINESS TOWARDS SUSTAINABLE PROJECT BUSINESS	105
6. FRAMEWORK.....	110
6.1 Sustainable Value Proposition at Project Level.....	112
6.2 Sustainable Supply Chain at Project Level.....	113
6.3 Customer Interface at Project Level.....	114
6.4 Financial Model at Project-level.....	115
7. MODIFICATION OF OSTERWALDER (2004) CANVAS USING THE REQUIREMENTS FOR SUSTAINABLE INNOVATION	122
III. METHODOLOGY.....	128

1. PARADIGMS IN SUSTAINABLE PROJECT MANAGEMENT	
RESEARCH	129
2. THE RESEARCH PHILOSOPHY.....	140
3. QUANTITATIVE CONTENT ANALYSIS	145
3.1 The sample frame.....	153
3.2 The elements within the sample frame	155
3.3 The data units	155
3.4 The measure and scale	156
3.5 Illustrative Example.....	159
IV. FINDINGS.....	165
4. EXPLORATORY FACTOR ANALYSIS.....	166
5. CONFIRMATORY FACTOR ANALYSIS (CFA).....	174
6. SECOND-ORDER CFA MODEL	178
7. DISCUSSION	181

8. THE DIFFERENCES BETWEEN THE FRAMEWORK DERIVED FROM THEORY AND THE MODEL DERIVED FROM DATA ANALYSIS..	185
V. CONCLUSION.....	189
APPENDIX A	193
APPENDIX B.....	197

Thesis Navigation Map

Thesis Navigation Map 1 The components of the Thesis	3
Thesis Navigation Map 2. Literature Review	4
Thesis Navigation Map 3. Framework derived from the Literature Review.....	111
Thesis Navigation Map 1. Chapter II: Methodology	128
Thesis Navigation Map 2. Study of options: Paradigms in Sustainable Project Management Research	129
Thesis Navigation Map 3. The Research Philosophy adopted in this Thesis.....	140
Thesis Navigation Map 4. The data Acquisition	153
Thesis Navigation Map 5. Chapter III: Findings	165
Thesis Navigation Map 6. Statistical Analysis (Structural Equation Model).....	174
Thesis Navigation Map 7 Graphical Representation of the Model Inference from Data Analysis.	185

LIST OF FIGURES

Figure 1 The literature review process. Source: Tong and Thomson (2015)	4
Figure 2 Flowchart of the Literature Review process. Source: Author	5
Figure 3 Articles found in databases using the keywords of table 1. Source: Author..	8
Figure 4 Articles frequency from 1999 to 2014	8
Figure 5 main authors of scientific papers. Source: Author	10
Figure 6 Cross-quote between authors	11
Figure 7 Sustainable Corporate Value Creation. .(Mitsubishi Corporation, 2012).....	14
Figure 8 Environmental, Sustainable Behaviors and Innovation of Firms During the Financial Crisis. Source: Kim (2013)	15
Figure 9 The Performance Frontier. Source Eccles and Serafeim (2013).....	17
Figure 10 The contrast between the concepts of sustainable development and projects	19
Figure 11 Sustainable Project Management Matrix	21
Figure 12 Conceptual model applied to the drivers action to generate new Strategy, Management and Performance	78
Figure 13 Left figure: Traditional alignment of the Iron Triangle with the PPP- Right figure: Sustainable alignment of the Iron Triangle with the PPP	80
Figure 14 The paradigm shift from Traditional Project Management to Sustainable Project Management	84

Figure 15 Drivers for Sustainable Innovation that allows the paradigm shift suggested by Silvius (2012)	85
Figure 16 Sustainable Project Life Cycle (Silvius, 2010)	86
Figure 17 Sustainable Business Canvas. Source: (Osterwalder, 2009)	87
Figure 18 Sustainable innovation Requirements to be met by the Business Model Canvas. Source: Authors, based on (Boons, 2013; Osterwalder, 2009)	89
Figure 19 Categories and Subcategories of the Project Life Cycle Model (Silvius, 2010)	90
Figure 20 Categories and Sub categories of Sustainable Business Model (Boons and Ludeke-Freund, 2013).....	90
Figure 21 Content analysis of Project Life Cycle, Sustainable Business Models and Sustainable Innovation Drivers.....	91
Figure 22 Key factors of sustainability in Project Management Context (Martens, Mauro L. & Carvalho, 2016a);	107
Figure 23 Project Sustainability Strategies (Aarseth et al., 2017)	108
Figure 24 Innovation drivers: From traditional to sustainable Project Management (Otegi-Olaso et al., 2016)	109
Figure 25 A cyclical-iterative approach to project SD strategy (Keeyes, Lynn A., 2014)	110
Figure 26 Four Strategic Postures for Sustainability in projects of the PBO (Silvius & Schipper, 2017).....	111

Figure 27 Framework for integrating sustainability in the innovation project portfolio management (Brook & Pagnanelli, 2014)	112
Figure 28 Project Business as a Research Field (Artto, K. & Kujala, 2008)	119
Figure 29 Business Model for Sustainable Innovation Canvas based on Osterwalder (2010) and Boons and Ludeke-Freund (2013)	140
Figure 30 Sustainable PM Research: Knowledge acquisition of PM Research trends	144
Figure 31 Action Research Model (PRAR Model).....	151
Figure 32 Methodology approach (adapted from Saunder's Onion)	156
Figure 33 Abductive inferences (Krippendorff, 2004) (p38)	159
Figure 34 Abductive inference of this research based on Krippendorff (2004)	159
Figure 35 Mixed method approach, adapted from Cameron et al. (2016).....	165
Figure 36 Analytical categories for the Content Analysis.....	169
Figure 37 Path diagram for models M1 and M2.....	190
Figure 38 Output path diagram for M2 Model. Confirmatory Factor Analysis to test the validity of the analytical construct (Theoretical Framework of Table 2)	192
Figure 39 Path diagram for Sustainable Business Model at project level and their sub-dimensions	194
Figure 40 Output path diagram for Sustainable Business Model (SBM) at project level and sub-dimensions.....	195

LIST OF TABLES

Table 1. Descriptors used in the search of information. Source: Author.....	6
Table 2 Publishers of the theoretical framework of this study. Source: Author.....	9
Table 3: Methods to Quantify the relationship between financial and ESG performance	18
Table 4 Analysis of the coverage of sustainability aspects in the PMBOK® Guide version 4.....	23
Table 5: Literature classification of the relevant authors.....	30
Table 6 Main contributions, future developments and implications for practitioners by Topic of Research: Sustainable Project Management.....	32
Table 7 Main contributions, future developments and implications for practitioners by Topic of Research: Sustainable Innovation.....	50
Table 8 The use of Business Model as analytical tool at Project level.....	120
Table 9 Framework for the Analysis of Sustainable Business Model at project level	131
Table 10 Modification of Osterwalder canvas according to Boons and Lüdeke-Freund requirements.....	136
Table 11 Modifications to the elements of Osterwalder's business model, considering the requirements of Boons and Ludeke-Freund (2013).....	137

Table 12 Journal for the framework Sustainability and PM Research	145
Table 13 Question to critically read papers about Sustainability and Project Management .	152
Table 14 Sustainable Project Management Research: Findings presented in the International Research Conference, Dortmund, 2016.....	154
Table 15 Analytical constructs based in the concepts of Boons and Ludeke-Freund (2013)	166
Table 16 Codebook to analyse projects through the lens of sustainable business model....	173
Table 17 KMO Analysis	182
Table 18 Measures of sampling adequacy.....	183
Table 19 Extraction of factors with eigen value >0.9.....	184
Table 20 Rotated component Matrix with Varimax Method.....	184
Table 21 Business Model Factors at project level	186
Table 22 Selected AMOS Output for CFA Model: Goodness-of-Fit Statistics.....	191
Table 23 Selected AMOS Output for SBM Model: Goodness-of-Fit Statistics.....	196

I. INTRODUCTION

The field of knowledge in Project Management has traditionally conceived as objectives the optimization of costs, time and quality. These objectives have been aligned to the economic needs of professionals and companies that operate with a single paradigm: The maximization of financial performance. However, this business behaviour, and its consequent academic concerns, have not considered an important point: financial efficiency has been achieved thanks to decades of outsourcing socio-environmental costs to society.

Today, companies are pressured to take responsibility for the environment and social impacts they generate during their operations. However, companies are reactive towards the demands of governments and stakeholders. One reason is that they find it difficult to integrate sustainability practices into their processes without affecting economic performance. These concerns have been transferred to the field of knowledge in Project Management. In recent years, the academy is looking for innovative tools for Project Managers and organizations, so that they can respond to the challenge of creating social, environmental and economic value through projects.

This thesis argues that the project should be considered as a temporary organization, which while delivering a product or service, also delivers value to customers and other stakeholders.

To study the project as a unit that delivers value, it is proposed to use the business model as an analytical tool. Furthermore, it is proposed to use the business model for sustainable innovation to evaluate the value delivery of projects in a more holistic way.

This thesis is structured in the following form:

The Chapter II is the literature review. This chapter evidences the need of the innovation for sustainability approach. This approach may serve to advance in the integration of environmental and social aspects at the project level. At the end of the chapter it is proposed a framework that would help to assess projects through the lens of business model for sustainable innovation.

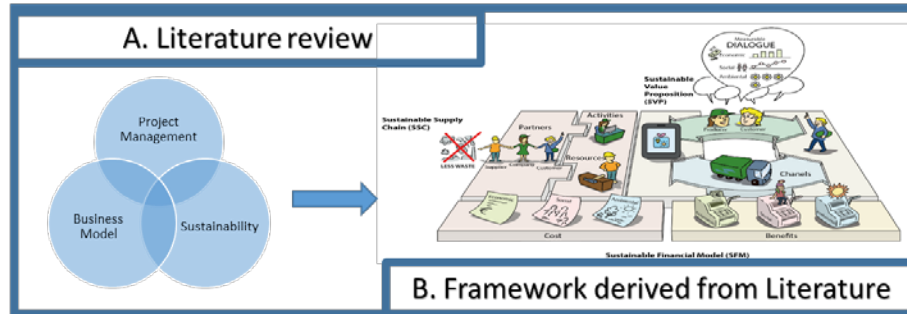
The chapter III is the Methodology approach. In this section it is explained the selection of the Quantitative Content Analysis and the Mixed Methods. This section also discusses the selection of the sample and data collection.

In the Chapter IV is presented the statistical analysis to interpret the data as well as the discussion of the results through the light of the literature review. The final chapter, presents the main conclusions and recommendations for future research.

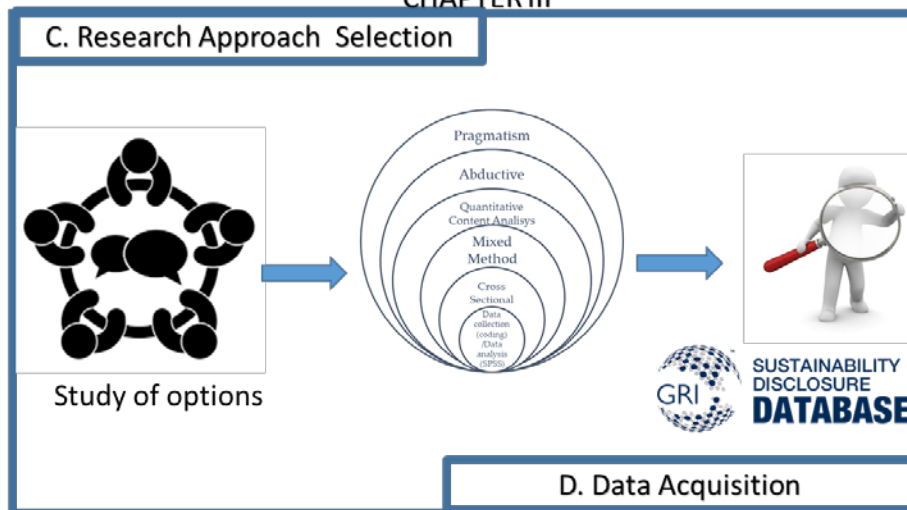
Finally, as the structure of this manuscript progresses, it is possible to find a "thesis navigation map" that highlights the key points dealt with in each section.

CHAPTER 1: INTRODUCTION

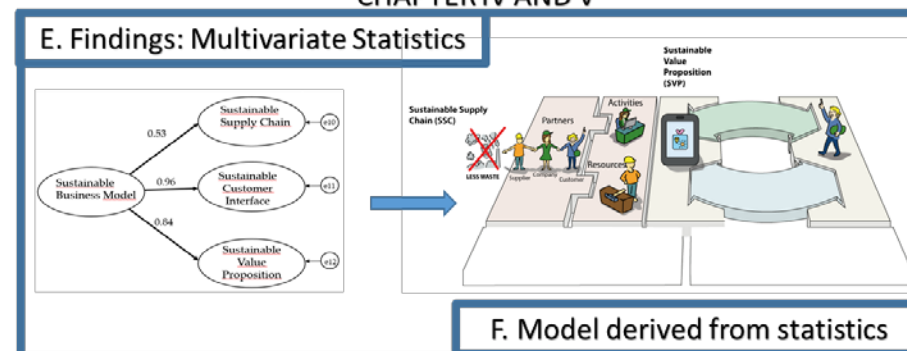
CHAPTER II



CHAPTER III

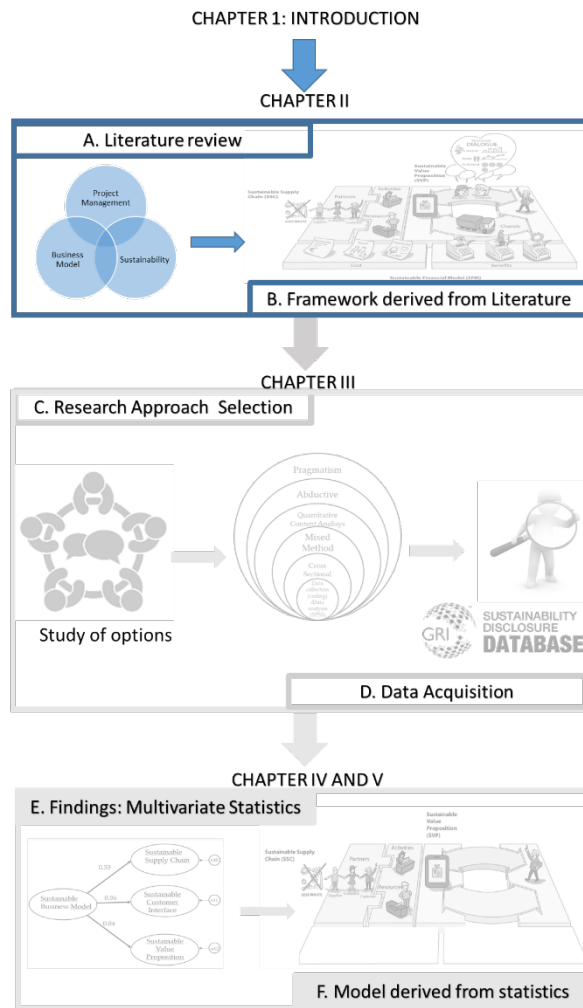


CHAPTER IV AND V



Thesis Navigation Map 1 The components of the Thesis

II. LITERATURE REVIEW



Thesis Navigation Map 2. Literature Review

The first objective of this chapter is to explore the state of the art that connects four streams of knowledge: Sustainability, Project Management, Innovation and Financial Performance. The starting point is that it is necessary to innovate in order to integrate the socio-environmental aspects to the Project Management practice. It should allow a transition without penalizing the financial performance or better yet, improving it. Consequently, it would be

expected that companies, and their Project Managers, transform their reactive behaviour into a proactive one towards sustainability.

The second objective of this chapter is to make an analysis of the relevant literature through the evaluation of contents and structuring of results. Here, it is explained the fundamental role of business model for sustainable innovation, and the principles of Sustainable Development applied to Project Management.

The third objective is to present a theoretical contribution that would increase knowledge in the area of Project Management for Sustainability. The proposal is to develop a framework for analysing projects from the point of view of business models for sustainable innovation. This tool is intended to observe the delivery of projects not only as a product or service but also as a delivery of social, environmental and economic value.

1. Preliminary literature review

Tong and Thomson (2015) propose that, in order to develop a critical review in Project Management Research, it is necessary to carry out an iterative process, as presented in Figure 1.

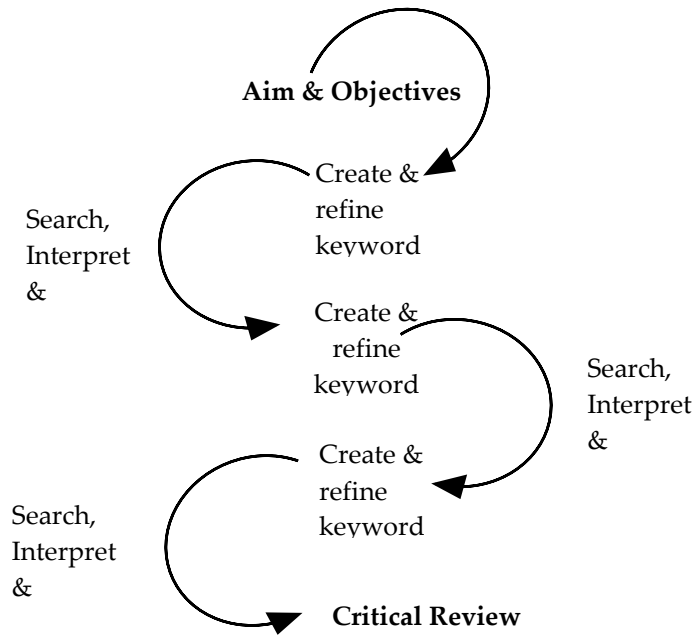


Figure 1 The literature review process. Source: Tong and Thomson (2015)

To complement a critical review of the literature, we propose the comparison of theories, the identification of relevant authors, the identification of gaps and the organization of data in tables and descriptive figures. It has been followed a process such as the one shown in the flowchart in Figure 2.

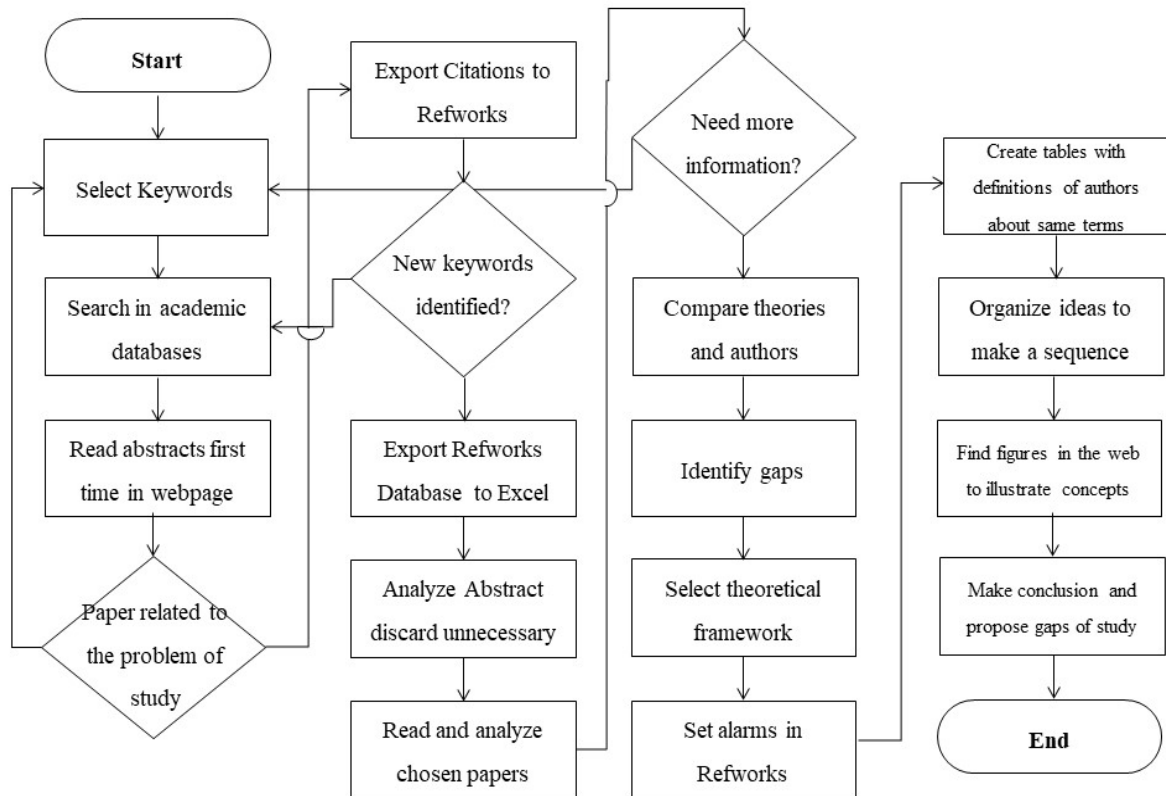


Figure 1 Flowchart of the Literature Review process. Source: Author

Identifying keywords and reading summaries are the initial steps. Once the information has been collected, it is necessary to organize the data to make comparisons of theories. This will serve to identify gaps and common definitions that match the research interest. The information collected is then presented in an interpretative narrative of the results.

Finally, it has been decided to set alarms in both, Reworks and Google Scholar. The objective of these alarms is to receive updated information on new articles related to the subject as well as the new research carried out by the identified authors. This will help that the interpretation of the results can be made with the updated literature.

As stated in the introduction, the aim of this study is to contribute new knowledge that connects streams such as sustainability, Project Management, Innovation and financial performance. Following the proposal of Tong and Thomson (2015), first the descriptors in Table 1 have been created. In the interpretation phase of the process, some keywords delivered more accurate results. These keywords are highlighted in bold.

Table 1. Descriptors used in the search of information. Source: Author

Financial Performance	Sustainability	Innovation	Project management
Business	sustainable	green innovation	Environmental
environmental	development	Sustainable	management
transformation	Sustainability	innovation*	practices
Business model	index	Eco-design	Green Project
for	sustainable	Environmental	management*
sustainability*	growth	innovation	Sustainable
Corporate	Sustainable	Green Marketing	Project
environmentalism	business model*	Market-oriented	Management*
Corporate	Sustainable	sustainability	Environmental
sustainability	business		management
	strategy*		

Corporate	Sustained	Innovation
sustainability	competitive	Project
performance*	advantage	Management
Corporate social	sustaining	Project
responsibility	corporation	Stakeholder
Dow Jones	Sustainable	Environment
Sustainability	finance*	
Index	Sustainable	
Green business*	Stakeholder	
Shareholder value	Capitalism	

*The most effective words in the research

The following scientific databases were used: Scopus, Web of Science, EBSCO and Google Scholar. The terms in Table 1 were used in the “Keyword”, “Title” and “Abstract” fields of the main tools available for searching for scientific information. The results were refined to the years 2005 through 2014, i.e. the decade prior to the beginning of the literature review. A brief reading of the title, abstract and parts of the documents helped to decide whether or not they were applicable to the study. When a document was valid, its citations were imported into the reference management database Refworks.

A total of 169 items were chosen. The Refworks database was exported to an Excel spreadsheet to analyse the results. Figure 3 is a Venn Diagram that

depicts the intersections of the knowledge domains and the number of articles found in each of them.

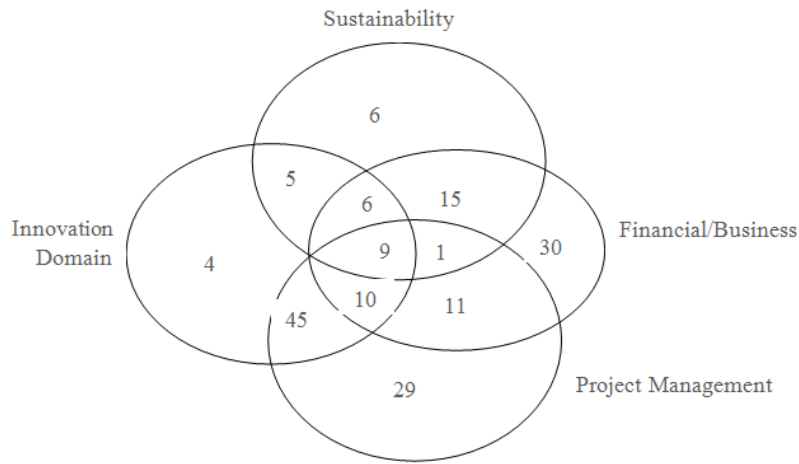


Figure 3 Articles found in databases using the keywords of table 1. Source: Author

Figure 4 shows the frequency of the journal articles in the years analysed (1999 – 2015). The graphic shows that it is a growing trend in the academic production.

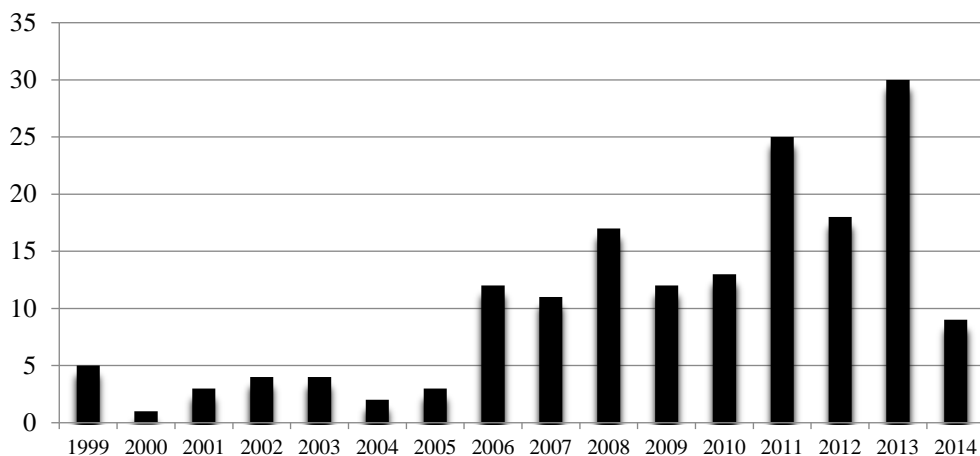


Figure 4 Articles frequency from 1999 to 2014

The most common journals were: Journal of Cleaner Production, and Ecological Economics, as it's showed in Table 2.

Table 2 Publishers of the theoretical framework of this study. Source: Author

Journals of publications	Frequency	%
Business Strategy and the Environment	1	4,2%
Ecological Economics	2	8,3%
Global Finance Journal	1	4,2%
Harvard business review	1	4,2%
International Journal of Managing Projects in Business	1	4,2%
Journal of Business Ethics	2	8,3%
Journal of Cleaner Production	7	29,2%
MIT Sloan Management Review Research Report Winter	1	4,2%
PM World Journal	1	4,2%
Project Perspectives	1	4,2%
Technovation	1	4,2%
Verslas: teorija ir praktika	1	4,2%
Others	4	16,7%

A reading of the abstract was the next step in selecting the most useful documents and discarding unnecessary ones; 50 articles were eligible for analysis through a more comprehensive reading of the research article to decide whether they can support the theoretical framework of this study. Fifteen of the 50 papers were suitable for the framework, but more specific information on sustainability and project management needed to be sought, so a new search was conducted and 9 sources were added. In the end, 24 papers were chosen to define the initial theoretical framework of this study.

Figure 5 is a representation of the main authors found. It is important to note that no author is mentioned in the area intersecting "Green Innovation-Sustainable Project Management". This is because no items belonging to this area were found in the databases. The field in which the 3 domains are crossed was searched deeply by keywords; however, no representative paper was found. This is an indication that there is room for a novel theoretical contribution.

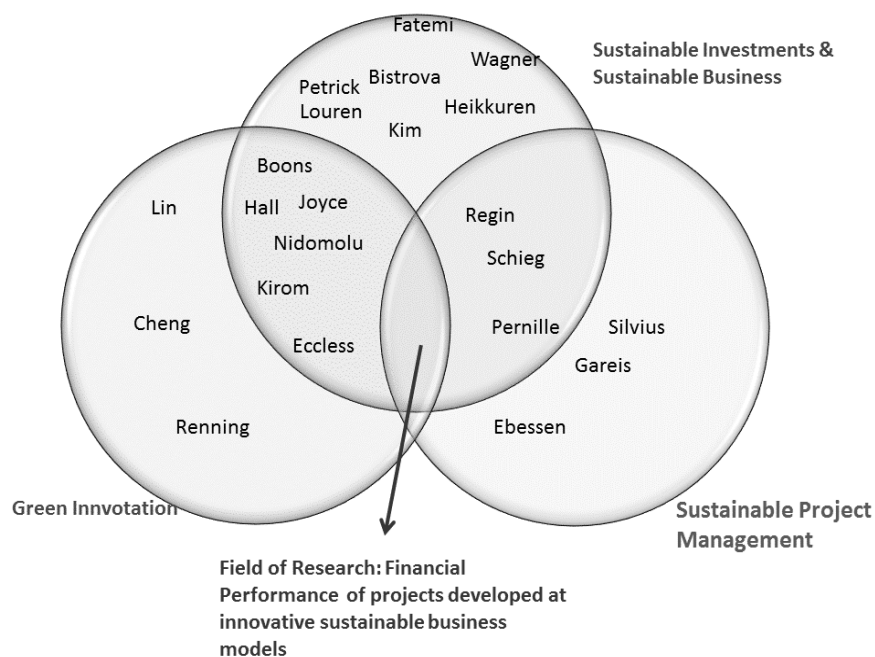


Figure 5 main authors of scientific papers. Source: Author

Figure 6 represents a cross-quote between the authors, the communication of knowledge among them and reveals a pioneering academic community. The identification of these authors and the way in which they collaborate has allowed a follow-up and update to the state of the art in the course of this investigation.

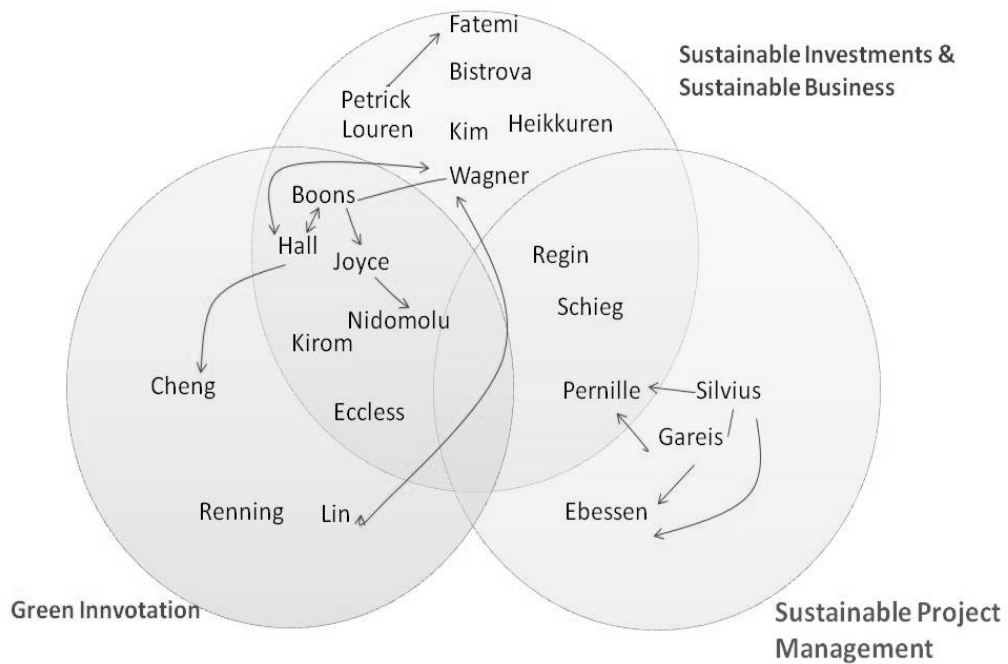


Figure 6 Cross-quote between authors

1.1 Findings of preliminary literature review

The first review of the literature shows that by 2014 there are sustainability studies with an important presence at the strategic and corporate levels. Sustainable innovation is inclined towards the environmental dimension, with few studies on the social aspect. In relation to Project Management towards Sustainability, there were already theoretical contributions to actively promote the paradigm shift towards sustainability. The most relevant result is that innovation is fundamental to integrate sustainability in business. (Eccles, Robert G. & Serafeim, 2013; Nidumolu, Ram, Prahalad, & Rangaswami, 2009).

1.1.1 Sustainability and Financial performance of corporations

Pearson (2006) argues that free markets are not perfect. Normally, to fix the selling price of a product is considered, among other factors, the cost of production. But prices are not real because they do not take into account the social and environmental costs generated by economic activities.

Fatemi and Fooladi (2013) also argue that this shareholder approach to maximizing wealth is no longer sustainable. The emphasis on short-term gains has as consequences long-term socio-environmental losses. Therefore, there is a need for a paradigm shift that makes explicit accounting of profit and loss in all three dimensions: Social, Environmental and Economic. This type of accounting is widely known as Triple Bottom Line (Elkington, John, 1997).

Although they are still a minority, investors who have long-term planning are investing in companies that demonstrate a tendency towards Corporate Responsibility because they recognize that only this strategy would produce long-term profits. Some of the stock market indices created under socially responsible investment criteria are FTSE4Good, DJ Sustainability World Index, SSE Sustainability Index, etc. Criteria include factors of corporate governance, ethical behaviour of the company towards stakeholders and care for the environment (Bistrova & Lace, 2011).

Companies wishing to attract the attention of sustainable investment funds integrate the objectives of sustainable development, economic efficiency and environmental performance into their operations (Labuschagne, Carin, Brent, & van Erck, 2005). However, this can be seen as a business tactic, but not as a strategy. A sustainable strategy covers the interests of various stakeholders such as: clients, investors, governments, NGOs. A sustainable strategy increases shareholder value while improving economic, social and financial performance (Eccles, R. G. & Serafeim, 2013). This business demeanour is known as Corporate Sustainability (Lourenço & Branco, 2013). To illustrate this concept, it is presented in Figure 7: The value creation model of Mitsubishi Corporation (2012).

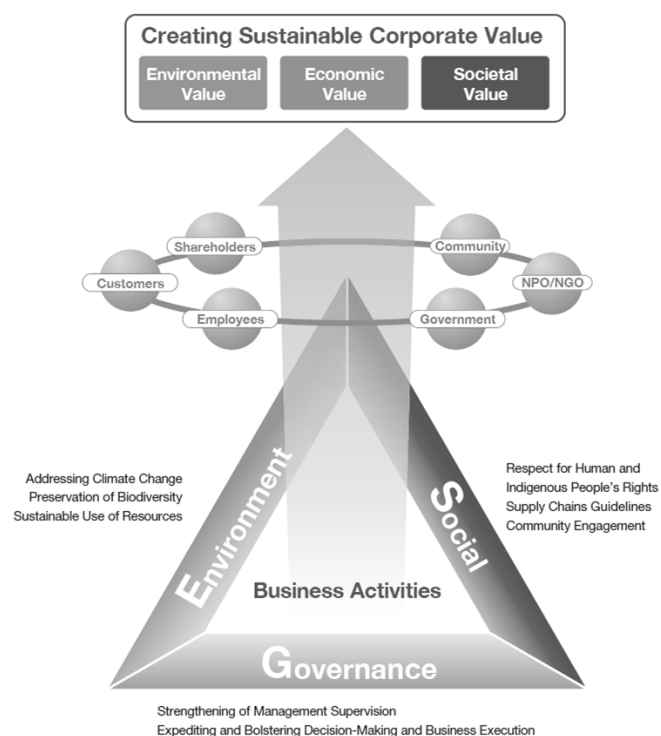


Figure 7 Sustainable Corporate Value Creation. . (Mitsubishi Corporation, 2012)

Mitsubishi's business activities are framed in the social dimension with respect for human rights, commitment to the community, care of the supply chain. In the environmental dimension, they take care of biodiversity and preserve resources. The Business activities receive the attention of different stakeholders, among them, customers, employees, governments, community. This ultimately creates economic value, social value and environmental value.

Several researchers have found evidence of the relationship between the sustainable behaviour of companies and a better performance in the triple bottom line:

- Cheng, Yang, and Sheu (2014)
- Eccles and Serafeim (2013)
- Kim (2013)
- Kiron, Kruschwitz, Reeves and Goh (2013)
- Lourenço & Branco (2013)
- Wagner (2010)

They agree that this has been possible because companies have integrated a main element in their strategy: Innovation oriented towards sustainability. For instance, Kim (2013) modelled Corporate Environmentalism (Figure 8) by establishing a relationship between environmental and sustainable behaviours

with sales and innovation. To do this, Kim (2013) took the data published by 1032 companies during the economic crisis of 2008 and 2009.

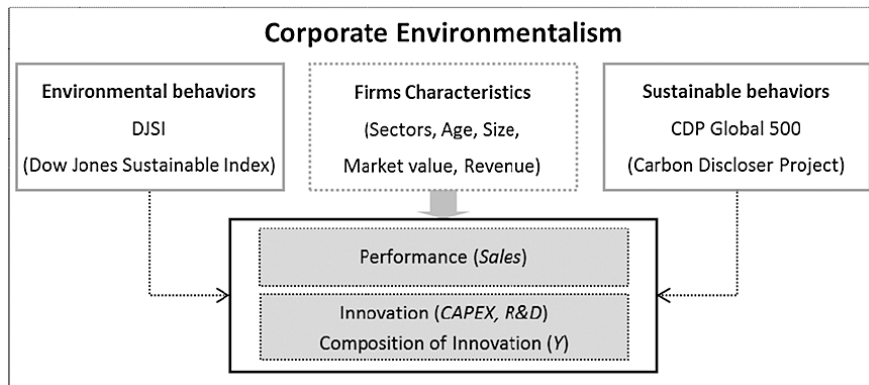


Figure 8 Environmental, Sustainable Behaviors and Innovation of Firms During the Financial Crisis. Source: Kim (2013)

Environmental performance data were taken from the DJSI Index. Sustainable behaviour data was taken from Carbon Disclose Project reports. Kim (2013) then related these to the amount companies allocated to R&D activities. The results indicated that the companies with the best sales performance during the crisis years were also those that had demonstrated the best environmental corporatism index.

Wagner (2010) also points out that the association of sustainability with economic performance depends on the ability of companies to differentiate their offerings, moderated by innovation activities and the level of advertising. Wagner (2010) argues that the social performance of companies seems to be positively associated if a company makes its innovative and sustainable activities known to stakeholders.

Another quantitative study that relates innovation, sustainability and triple bottom line is the one carried out by Eccles and Serafeim (2013). As a result of the data, they developed a conceptual model called "The Frontier of Performance". This model indicates that companies receive returns on their sustainability efforts whenever innovation is present. As social and environmental performance increases on the X-axis, the economic value of the Y-axis curve also increases thanks to innovation in processes, products or business models. The greater the innovation, the greater the profitability of the triple bottom line. In other words, the more radical the innovation, the better the curve levels out.

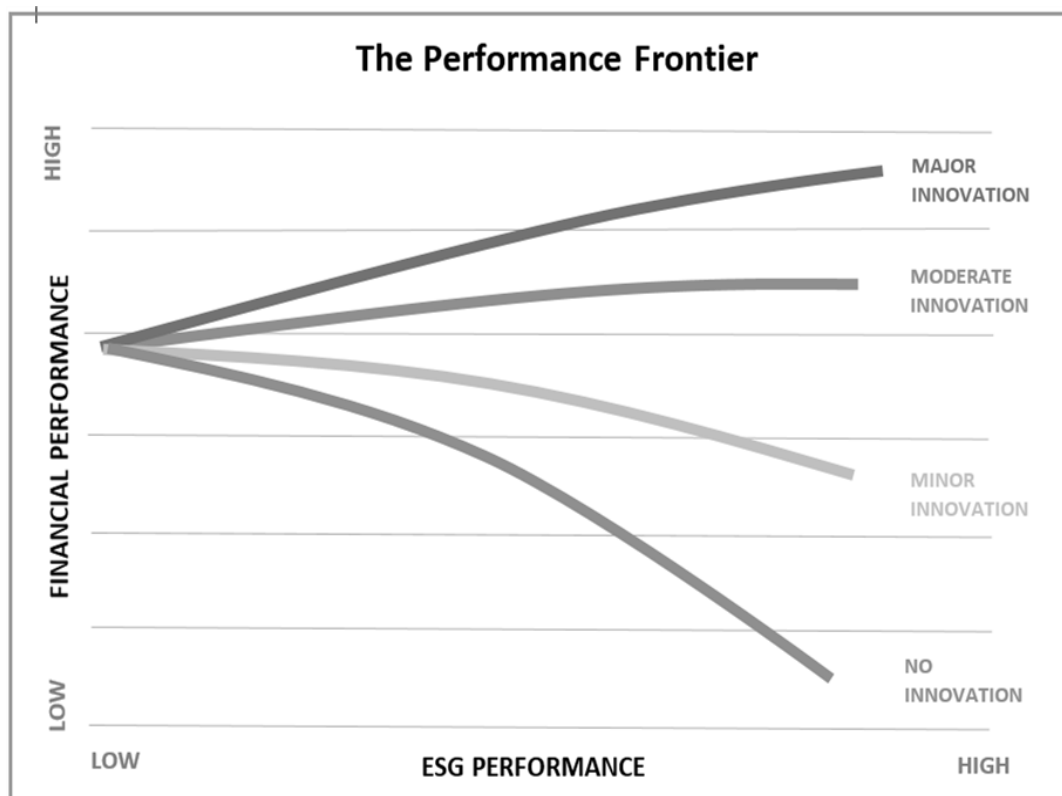


Figure 9 The Performance Frontier. Source Eccles and Serafeim (2013)

According to Eccles and Serafeim (2013), in order to achieve this objective, companies must make an effort to identify the key socio-environmental aspects of their business activities, especially those that add value to the competitive strategy. Once these aspects have been identified, it is necessary to quantify them, using the tools that the academy has developed to guide managers. The next step would be to innovate in processes, products and services. Finally, and as recommended by Wagner (2010), communicate these activities to stakeholders.

The Table 3: Methods to Quantify the relationship between financial and ESG performance, compiles the main approaches found in the literature which, together with Eccles and Serafeim (2013), indicate the need to design adequate indicators, aligned to the strategy and publicly available to the markets.

Table 3: Methods to Quantify the relationship between financial and ESG performance

Author	Approach/Index
Lourenço & Branco (2013)	<p>The sustainability indices linked to financial markets that have been developed around the world aim at providing investors with further insight into corporate sustainability performance.</p> <p>Examples are the Dow Jones Sustainability Index, the FTSE4Good, and the Bovespa Corporate Sustainability Index. They help to highlight corporations with exemplary sustainability</p>

performance. These indices may be thought of as serving as
“information brokers”

Eccles & Serafeim (2013). SASB’s approach to sustainability accounting consists in defining metrics or indicators – both qualitative and quantitative – that express a fair representation or “account for” company performance on material sustainability topics, and ensure that reasonable investors have access to the "total mix" of information in their decision making process

Kiron et al., (2013) Sustainability-Driven Innovators use scorecards, KPIs and other integrated reporting tools that track performance against goals. These measures give a clear signal that top management takes the effort seriously. In many cases, sustainability results are a key element of performance reviews and compensations.

1.1.2 Sustainability and Project Management

Projects may be a vehicle of the changes that society requires. However, Silvius (2012) illustrates that projects and sustainable development are probably not ‘natural friends’ if the traditional perspective of management is maintained. Figure 10 illustrates some of the ‘natural’ differences in the characteristics of the two concepts.

Sustainable development		Project management
Long term + short term oriented	←→	Short term oriented
In the interest of this generation and future generations	←→	In the interest of sponsor/stakeholders
Life-cycle oriented	←→	Deliverable/result oriented
People, planet, profit	←→	Scope, time, budget
Increasing complexity	←→	Reduced complexity

Figure 10 The contrast between the concepts of sustainable development and projects

Projects, from the traditional perspective, are planned under restricted conditions such as time, budget, results and interest of the sponsors. On the other hand, sustainable development needs more factors to be taken into account in the planning phase of the project, like the long-term impact and the consideration of other stakeholders rather than only sponsors.

The lack of sustainability considerations in traditional project management is evident, for instance in the most common standards. Authors like Eskerod and Huemann (2013) assert that standards fail to seriously address or equip project managers with the necessary tools to integrate sustainability in their practices. However, according to Schieg (2009), three essential factors make ethical and ecological behaviour in projects inevitable: The gain of reputation for the project, the reduction of financial risks related to potential legal disputes, and the creation of competitive edge by early alignment to regulations.

Due to the inevitability to adopt this ethical and ecological behaviour, consultants like Keeble et al. (2003) have posed four key questions for project managers:

1. Will the project generate prosperity and enhance the affected economies?
2. Will the project be implemented in a socially responsible manner and benefit the affected communities in a fair and equitable way?
3. Will the project cause long-term damage to the environment?
4. Will the project protect and enhance natural capital?

Gareis et al. (2011) have also developed the SustPM Matrix, provided in Figure 11, to relate sustainability principles to project management. The principles of sustainability are economic, social and ecological, short, medium and long term, local, regional and global, as well as value-oriented. Project management is then confronted with these six characteristics in order to develop new project management approaches.

<div style="text-align: center;">Project Management</div> <div style="text-align: center;">Sustainability</div>	Project objectives, strategies	Project scope, schedule	Project costs, income, risks, resources	Project organization, culture, personell	Project context relations	Project management process
Economic-oriented						
Ecologic-oriented						
Social-oriented						
Short, mid, long-term oriented						
Local, regional, global-oriented						
Value-oriented						

Figure 11 Sustainable Project Management Matrix

Source: Gareis et al (2011): What Can Project Management learn for considering Sustainable Principles?

In the integration of the concepts of sustainability in projects and project management, similar to Gareis et al. (2011), Silvius (2012c) considers six principles:

1. Sustainability is about balancing or harmonizing social, environmental and economic interests.
2. Sustainability is about both short term and long term orientation
3. Sustainability is about local and global orientation
4. Sustainability is about consuming income, not capital
5. Sustainability is about transparency and accountability
6. Sustainability is also about personal values and ethics

In a more extensive analysis, Silvius et al. (2012c) related the PMBoK and the Sustainable Project Management Model that they are developing, as shown in Table 4. Silvius et al. (2012c) use their principles and a holistic point of view to make a critical assessment of the areas, chapters and even sections about what it is and what should be a Sustainable Project Management.

Table 4 Analysis of the coverage of sustainability aspects in the PMBOK® Guide version 4.

Area of Impact	PMBok Guide	Sustainable PM
Project context	<p>Section 1.8, Enterprise Environmental Factors, mentions the organization’s human resources and marketplace conditions as “internal or external environmental factors that surround or influence a project’s success”. But the section fails to more explicitly identify potential social or environmental interest resulting from sustainability policies as factors of influence.</p>	<p>The context of the project is addressed in relationship to the organization's strategy, but also in relationship to society as a whole</p>
Stakeholders	<p>In Section 2.3, Stakeholders, or the definition of stakeholders in the Glossary, any reference to typical sustainability stakeholders as environmental protection pressure groups, human rights groups or nongovernmental organizations are lacking. In fact, chapter 10, Project Communications Management, also fails to recognize these potential stakeholders when it discusses stakeholder communication.</p>	<p>In the identification of potential stakeholders, explicit notion is made of potential stakeholders representing the environmental and/or social aspects of the project. Communication with stakeholders includes proactive engagement with potential stakeholders.</p>
Business Case	<p>Section 4.1.1., Develop Project Charter, mentions “Ecological impacts” and “Social needs” as potential benefits of a project when it discussed the business case.</p>	<p>The business case addresses the 'triple bottom line' of economic, social and environmental benefits. Investment evaluation is done based on a multi-criteria approach of both quantitative and qualitative criteria</p>

Project Success	As stated earlier, the PMBOK® Guide mentions compliance with the project's requirements and objectives and specifically the demands of scope, time, cost, quality, resources and risk as aspects of the project's success. No mention is made of social or environmental aspects, unless included in the project's requirements or objectives.	The definition and perception of project success take into account the 'triple bottom line' of economic, social and environmental benefits as laid out in the business case, both in the short term as in the long term. This implies that the success of the project is assessed based on the life cycle of the project and its result.
Material and Procurement	Processes related to the selection of materials and procurement can be found in different sections of the PMBOK® Guide. For example, section 3.4.20 Plan procurements, section 3.5.8. Conduct procurements, chapter12 Project Procurement Management. None of these sections include any references to sustainability aspects in for example the selection of suppliers or the selection of materials.	In the selection of materials and suppliers for the project, these decisions are also based on environmental and social considerations.
Project reporting	Project reporting processes can be found in the PMBOK® Guide in section 3.6.8. Report Performance and section 10.5 Report Performance. In these sections, project reporting focuses on progress and changes in the areas scope, schedule, cost and quality of the project. Reporting on sustainability aspects is not explicitly addressed, nor is the principle of transparency.	Project reporting is pro-active and transparent. Project progress is reported on different aspects of the project, including environmental and social aspects.

Risk management	Chapter 11, Project Risk Management, of the PMBOK® Guide, does mention a process and several techniques to identify risks. However, these techniques do not mention the possibility of environmental and/or social risks.	The risk identification and risk management processes include the identification and management of environmental and/or social risks
Project team	Chapter 9 of the PMBOK® Guide, Project Human Resource Management, shows little consideration of social sustainability aspects such as life-work balance, equal opportunity, part time job opportunities, etc. Section 9.2.2., however, pays attention to ‘virtual teams’ and links this to team members working from home offices, potentially with mobility limitations or disabilities. Also the personal development of team members is addressed. The objective for this development, however, is the performance of the project team, without considering the effectiveness of team members in their professional life after the project.	The management and development of project team members is aimed at preparing them for their role in the project and keeping them fit for this role. But also considers the effectiveness of team members in their personal and professional life after the project.
Organizational learning	Section 2.4.3 mentions 'Historical information and lessons learned' as part of the 'Corporate Knowledge Base' of the organization. However, this section lacks a more explicit reference to organizational learning or knowledge management in order to improve an organization's competence in doing projects.	Lessons learned and previous experiences are explicitly captured during project execution and closing and are made to use in the initiation and start-up of new projects. This is done to improve an organization's competence in doing projects.

Source: (Silvius, 2012c). <http://www.slideshare.net/GilbertSilvius/analysis-of-the-coverage-of-sustainability-aspects-in-the-pmbok>

2. Systematic literature review

The objective of this section is to perform a deeper and structured analysis about the state-of-the art of Sustainable Project Management and the Sustainable Innovation literature in order to identify the main aspects that connect both fields. Two questions are addressed:

- Which aspects of traditional Project Management field have evolved to Sustainable Project Management?
- What is the impact of Sustainable Innovation in this evolution?

2.1 Selection of papers

The sources consulted to develop the bibliometric study include databases, recognized journals, conference papers, books with high impact on the topic, internet sites and international standards.

The search strategy is based on selected keywords: “Sustainable Project Management”, “Green Projects”, “Sustainable Innovation”, “Eco-innovation” and other keywords listed in Table 1. Based on this, a population of 560 articles was identified. Then, the abstracts of papers were read, through the lens of two questions: does the paper analyse the Sustainable Development and Project Management? And, does the paper analyse the Sustainable Innovation issues? Using this questions, a selection of 30 papers was refined.

2.2 Results: Inductive approach

The Table 5 presents the paper divided in two topics. The first one is sustainability and Project Management, the second one is Sustainable Innovation.

Table 5: Literature classification of the relevant authors

Topics	Main articles
Sustainable Project Management	Labuschagne, C. et al (2004), Gareis, R. et al (2009), Schieg, M. (2009), Silvius, G. et al (2010), Tam, G. (2010), Gareis, R. et al (2011), Talbot, J. et al (2011), Brocke, J. V. et al (2012), Silvius, G. et al (2012), Ebbesen, B. et al (2013), Eskerod, P. (2013), Sánchez, M. A. et al (2013), Brook, W. J. et al (2014), Hope, A. (2014).
Sustainable Innovation	Störmer, E. (2006), Stubbs, W. et al (2008), Hansen E. G et al (2009), Knight, P. et al (2009), Nidomolu, R. et al (2009), Lüdeke-Freund, F. (2009), Santolaria, M. et al (2011), Hall, J. et al (2012), Schaltegger et al (2012), Sommer, A. (2012), Verhulst, E. et al (2012), Boons, F. et al (2013), Eccles, R. et al (2013), Hallstedt, S. (2013), Kiron, D. et al (2013), Upward, A. (2013), N.M.P. et al (2014).

Table 6 and Table 7, summarize the content of the papers. The column “findings” describe the main results of the papers, the column “contribution” list the proposal made by authors like models, frameworks and procedures to integrate social and environmental aspects besides the economic ones. The column “key aspects” describe the most essential characteristics of the papers, in relation to the aforementioned questions, that could drive the integration of sustainability. Finally, the column “categories of key aspects” group common terms, for instance, indicators development and measurement are gathered in the category Performance (P), training and communication are gathered in the category Management (M), extend value proposition and partnership are gathered in the category Strategy (S).

Table 6 Main contributions, future developments and implications for practitioners by Topic of Research: Sustainable Project Management

Author	Findings	Contribution	Key aspects	Categories of key aspects		
				S	M	P
Labuschagne, C. et al (2004)	Project management methodologies must thus incorporate planning, execution and implementation procedures within the broader sustainability framework (...)	To align project management frameworks with the principles of sustainable development is a need. (...) Business sustainability is becoming a prerequisite for global competitiveness and	<ul style="list-style-type: none"> •Social impact indicators •Training, client cooperation 			X
	Current indicator frameworks that are available to measure overall business sustainability do not effectively address all	companies worldwide. The strategic importance of project management drives the integration of environmental	<ul style="list-style-type: none"> •Integration of sustainability into a life-cycle project 	X	X	

	<p>aspects of sustainability at operational level.</p> <p>Social aspects and impacts are rarely considered during project management, while environmental factors are typically only addressed by means of Environmental Impact Assessments (EIAs).</p>	<p>and social sustainability objectives into a life-cycle project management framework.</p> <p>This paper proposed a framework to assess the sustainability performance of a project in the process industry. It also provides a procedure to integrate the environmental aspects into the current project management frameworks.</p>	<p>management framework</p> <p>•Measure and track (goals and performance)</p>	X
Gareis, R. et al (2009)	<p>Analysis of the relationship between sustainable development and project</p>	<p>Development of a model to relate sustainable development and project management based</p>	<p>•Hidden sustainability identification</p>	X

<p>for their applicability in projects.</p>	<p>employees, and anchored in the project culture.</p>	<p>•Communicate the values and vision</p>	<p>X</p>
<p>For successful implementation of CSR activities, it is essential to align the commitment of the project organization to the own business operations and own goals.</p>	<p>-The CSR concept has to be integrated in the project strategy, and thus influences the project workflows.</p>	<p>•Integrated to the project strategy</p>	<p>X</p>
<p>Three essential factors make ethical and ecological behaviour in projects inevitable: 1) The gain of reputation for the project, 2) the reduction of financial risks related to potential legal disputes, 3) the creation of</p>	<p>-Employees have to be involved in implementation and realization of the CSR-program. -The CSR targets and activities have to be defined, communicated, and checked for compliance. -The success of CSR activities, as well as their expenses, has to</p>		

	<p>competitive edge by early alignment to regulations pending adoption.</p> <p>Introduction of CSR to projects using already existing standards generally improves cooperation between the project players for the benefit of more efficient project handling, and trustful cooperation</p>	<p>be controlled, tested and evaluated.</p>		
<p>Silvius, G. et al (2010)</p>	<p>Sustainability is recognized as one of the most important challenges of our time.</p>	<p>This paper presents a practical maturity model for assessment of the integration of the concepts of sustainability in projects and project</p>	<p>•Measure and track (goals and performance)</p>	<p>X</p>

Projects can make a contribution to the sustainable development of organizations. Be expected that the concepts of sustainability are reflected in projects and project management. And although some aspects of sustainability are found in the various standards of project management, it has to be concluded that the integration of sustainability in projects and project management is not fully recognized yet.

management. It provides a practical tool for the translation of abstract and interpretive concepts into prescriptive actions.

<p>Tam, G. (2010)</p>	<p>Program management has been widely accepted as an effective tool for making strategic and tactical changes.</p>	<p>A "Program Sustainability Assessment Framework" that has been constructed to help the program manager to incorporate sustainability considerations into program management practices.</p>	<ul style="list-style-type: none"> •Measure and track (goals and performance) 	<p>X</p>
	<p>The requirements and impacts of sustainability are becoming important considerations in formulating a program; however, not much related literature can be found within the project management body of knowledge.</p>	<p></p>	<ul style="list-style-type: none"> •Sustainability strategy alignment 	<p>X</p>
	<p>Sustainability is a thinking dimension. It is important to</p>	<p></p>	<ul style="list-style-type: none"> •Training on sustainability •Thinking dimension 	<p>X</p>
	<p></p>	<p></p>	<ul style="list-style-type: none"> •Thinking dimension 	<p>X</p>

	establish a culture of care of environment and people (stakeholders).		•Incorporation of sustainability in strategy	X
Gareis, R. et al (2011)	In project management some sustainability principles are implicitly considered, when projects do stakeholder analysis and risk analysis.	To gain competitive advantage sustainability must be integrated into the core process of an organization such as project management process.	•Incorporation of sustainability in strategy	X
Talbot, J. et al (2011)	The imbalance between the definition of sustainability and the definition of a project has made it difficult to incorporate meaningful sustainability	In this paper there has been proposed a framework for integrating sustainability into project baselines consulting engineering projects in the	•Incorporation of sustainability in strategy	X

	indicators into project baselines.	industrial and resource extraction fields. This framework is based on using a sustainability indicator set that has been derived from existing sets applicable to the industrial or resource extraction projects.	•Indicators - ESG issues	X
Silvius, G. et al (2012)	The pressure on companies to broaden their reporting and accountability from economic performance for shareholders to sustainability performance for all stakeholders has increased	Sustainability principles provide guidance for analysis of the impact of the concepts of sustainability in projects and project management. It is mentioned that in order to change the way we DO things,	•Incorporation of sustainability in strategy •Thinking dimension	X X

	<p>Elaborating on the view of projects as instrument of change, it is evident that a (more) sustainable society requires projects to realize change.</p> <p>It is recognized that project managers are not well equipped to make a contribution to sustainable development.</p>	<p>there is a need to change the way things are VIEW.</p> <p>Project Management standards fail to address sustainability</p>	<p>•Training on sustainability</p>	
<p>Ebessen, J. et al (2013)</p>	<p>The consideration of sustainability principles into the project management field is gaining importance and there</p>	<p>While sustainability is seen by practitioners as a key factor to be included in project planning and implementation, there is a</p>	<p>•Training on sustainability</p>	<p>X</p>

is an increasing understanding of the need to develop methods, tools and techniques to integrate sustainability criteria into the management of projects.

disagreement as to where the issue sits in relation to traditional time, cost and quality constraints and how sustainability has to be integrated.

•Thinking
dimension

X

The concept of 'Sustainable Project Management' is a response to the realisation that many of the current project management frameworks do not effectively address the three goals of sustainable development.

Eskerod, P. et al (2013)	<p>The research findings suggest that stakeholder issues are treated superficially in the project management standards, while putting stakeholder management in the context of sustainable development would ask for a paradigm shift in the underpinning values.</p> <p>Reveals a lack of focus on sustainability issues even though a societal request for sustainable development seems to make project</p>	<p>A proposal:</p> <p>A societal request for considering sustainable development as a context for projects, places new demands on project stakeholder management, especially when it comes to underpinning values.</p>	<p>•Stakeholder management</p>	X
--------------------------	--	--	--------------------------------	---

	stakeholder management more challenging in the future			
Sánchez, M. A. et al (2013)	Many companies adopted sustainability in their mission statement and strategy; however, social and environmental dimensions of sustainability are difficult to incorporate in programs and projects.	This paper defines a framework to evaluate projects that takes into account profits and economic, environmental, and social impacts. The methodology comprises four steps. (...)The framework provides the means to integrate Sustainability Analysis and Project Management in operational terms since sustainability results are used to solve a decision problem to	•Incorporation of sustainability in strategy	X

		support the selection and monitoring tasks.		
	(C/F) sustainability has to be an integrated part of the Portfolio, Program and Project processes.		<ul style="list-style-type: none"> •Management of portfolio related to sustainability 	X
Hope, A. J.etal (2014)	(C/F) Sustainability principles can be actively influenced, encouraged and monitored through project portfolio, program and project management.		<ul style="list-style-type: none"> •Incorporation of sustainability in strategy 	X

Table 7 Main contributions, future developments and implications for practitioners by Topic of Research: Sustainable Innovation

Author	Findings	Contribution	Key aspects	Categories of the key aspects		
				S	M	P
Störmer, E. (2006)	Regional environmental information-oriented corporation networks (RUN) does not provide a guarantee for significant improvements in a firm's environmental behaviour.		<ul style="list-style-type: none"> •Cooperation stakeholders. •Integration of sustainability improves performance 	X		x
Stubbs, W. et al (2008)	Sustainability in Business draws on economic, environmental and Social Aspects of Sustainability in	The article develops a "sustainability business model" anchored by the ecological modernization:	<ul style="list-style-type: none"> •Sustainability is drawn in the organization's purpose 	X		

	defining an organization's purpose.	A model where sustainability concepts shape the driving force of the firm and its decision making. The characteristics of the sustainable business model are classified by structural and cultural attributes	<ul style="list-style-type: none"> •TBL approach to measure performance •Leadership necessary to implement sustainability 	X
	A SBM uses a TBL Approach in measuring performance.			
	Sustainability Leaders drive the cultural and structural changes necessary to implement sustainability.			X
Hansen E. G et al. (2009)	Research experts perceive business model innovation as a measure to redirect needs and satisfy them I an alternative	The paper presents a model named the Sustainability Innovation Cub for structuring	<ul style="list-style-type: none"> •Model to minimize the risk of sustainability 	X

	<p>way. However, business executives disagreed on whether or not this dimension offers significant business opportunities.</p>	<p>innovations sustainability oriented effects in order to inform innovation how to minimize the risk of Sustainability Oriented Innovations.</p>	
<p>Knight, P. et al (2009)</p>	<p>Identification of how eco-design techniques can be determined as being compatible with new product development processes. Three key eco-design techniques were identified: checklists, guidelines, and a material, energy and toxicity (MET) matrix.</p>		<p>•Re-thinking business model X</p>

Lüdeke-Freund, F. (2009)	Introduction the concept of a SBM: is the structural template of a business logic which creates the business case for sustainability. This can be achieved by	•Business case for sustainability	X	
	value propositions to integrate public and private benefits (product/value proposition pillar),	•Extend value proposition	X	
	•making customers involved and responsible partners in value creation processes (customer interface pillar)	•Customers involved	X	
	•taking	•Partnerships	X	
		•Measure and track (goals and performance)		X
		•Indicators – ESG issues		

advantage of partnerships
which enhance resources
and activities
(infrastructure pillar), •
evaluating combined
measures like
Environmental
Shareholder Value and
Environmental/Social
Business Model Value
(financial aspects pillar),
and • dedicating
resources and activities to
secure free, legitimate and
legal behaviour and to
explore currently
neglected opportunities in

X

non-market spheres (non-market pillar).

	Becoming Environmental friendly can low cost and increase revenues.	•Sustainability can low cost and increase revenues		X
Nidomolu, R. et al (2009)	In future only companies that make sustainability a goal will achieve competitive advantage.	•Re-thinking business model	X	
	That means rethink business model as well as products, process and technologies.	•Stages of sustainability innovations		X
	Becoming sustainable is a 5 stage processes, and each stage has its own challenges:			

	Viewing Compliance as Opportunity->Making Value Chains Sustainable->Designing Sustainable Products and Services ->Developing New Business Models->Creating Next Practice Platforms		
Santolaria, M. et al (2011)	Sustainability is a cardinal driver for innovation and that responses have specificities regarding company size, activity or respondent position	•Measure and track (goals and performance)	X
Hall, J. et al, (2012)	Author pointed out that innovation is probably a panacea for sustainable development, but only if	•Innovation is a panacea for sustainable development if	X

business models are radical enough to enable strong performance effects, specially environmental performance

innovate business model.

•Integration of sustainability improves performance

X

There are differences in the link between integration and environmental performance, depending on the type of business model or innovation pursued.

Firms which build their business model on cross-functional problem solving have more positive of their

integration with higher economic performance.

Firms which build their business model on a modular approach have less positive association of their integration with higher economic performance.

Hallstedt, S. et al (2012)

Identification of the key elements for successful implementation of a strategic sustainability perspective in the early phases of the product innovation process.

•Incorporation of sustainability in strategy

X

It is necessary to manage product development in a more sustainable way, by exploring how product-developing companies can introduce a strategic sustainability perspective in their product innovation process.

Schaltegger, S. et al (2012)	A company which tries to improve its sustainability performance has to change its business model, however incremental or radical, which can turn out to be the decisive factor for succeeding in	The author provides an integrated framework of the business case for sustainability based on sustainability strategies, business case drivers, and	•Improving Sustainability performance by changing business model	X
------------------------------	--	--	--	---

	<p>creating one or many business cases for sustainability</p> <p>(Concerning different intensities of business model modification and innovation.</p>	<p>business model Innovation.</p>	<ul style="list-style-type: none"> •Business case for sustainability •Framework based on sustainability strategies and SBM 	<p>X</p> <p>X</p>
Sommer, A. (2012)		<p>The author provides a concept about what is a business model, based in its value chain.</p>	<ul style="list-style-type: none"> •Prototype of business model with green potential •Framework for SBM transformation 	<p>X</p> <p>X</p>

business models with
green potential.

The outcome is a
comprehensive
management framework
for
Green Business Model
Transformations

Verhulst, E. et al (2012)	Sustainability can be added to the standard business model leading only to limited changes, or the implementation of the strategies lead to the development of a new business	•SBM innovation have higher impact than activities that innovates only products and processes.	X
------------------------------	--	--	---

model that delivers more sustainable outcomes.

Focusing on product and process related activities do not lead to substantial changes in business models, whereas developing activities that span beyond products and processes, such as developing product service systems, have a considerably larger impact on the business model and can thus lead to well-integrated sustainable business models.

•The sustainable innovation depends on the strategy X

The influence on the business model is indicated in the study to depend on the choice of strategy for sustainable product innovations and on the maturity of the firm.

Boons et al.,
2013).

The authors found that research of sustainable innovation has tended to neglect the way in which firms need to combine a) value proposition b) the organization of the upstream and downstream value chain and c) financial model in order to

The authors propose requirements that business models should meet in order to support sustainable innovation.

•Re-thinking
business model

X

	bring sustainable innovations on the market			
Eccles, R. et al (2013).	<p>The main aim of the paper is to address how organization sustainability and resilience can be achieved with BMI and study the role of different factors in this process</p> <p>The author state that in order to integrate both kinds of performance: economical and sustainable it is necessary the sustainable innovation.</p>	<p>Author presents a tool to determine "Materiality" (the economic impact of the ESG issues).</p>	<ul style="list-style-type: none"> •Achieve sustainability with innovation •Economic impact of ESG issues •Communication with stakeholders 	<p>X</p> <p>X</p> <p>X</p>

		•Working with young generation	
	Identified characteristic of the sustainability driven innovation. The research found that top management attention is central.	•Characteristics of the sustainability driven innovations	X
Kiron, D. et al (2013)	Another key sustainability approach is collaboration with customers and nongovernmental organizations on sustainability-related issues. A third element is the business model innovation, and collaboration	•Top management attention	X
		•Collaboration with customers and NGO	X

	<p>with the client to analyse the lifecycle of several products. New internal organizational structures. Sustainability driving innovators integrate the efforts into operations and planning, it is not a stand-alone department. Customers are the centre.</p>	<ul style="list-style-type: none"> •Collaboration with client to analyse the lifecycle of product •Measure and track (goals and performance) 	X
Upward, A. (2013)	<p>Based on criticism and review, this research project extends the Business Model Ontology artefact to enable the description all the</p>	<ul style="list-style-type: none"> •Description and representation of a sustainable business model 	X

constructs and their inter-relationships related to a strongly sustainable business model. This results in the Strongly Sustainable Business Model Ontology (SSBMO). To help evaluate the SSBMO a practitioner visual design tool is also developed: the Strongly Sustainable Business Model Canvas (SSBMC)

Bocken, N.M.P. et al (2014) The Front End of Eco-Innovation (FEEI) is aligned

•Re-thinking business model X

with conventional business concerns such as satisfying (green) consumer demand and generating revenue.

Concepts and tools such as cradle-to-cradle and LCA are used systematically during the innovation process, but internal idea generation techniques are often informal. To nurture sought-after creativity skills in employees is to allow them to experiment with their own eco-innovative ideas.

<p>Brook, W. J. et al (2014)</p>	<p>The importance to enhance the ability of firms to achieve an effective balance of investment between the three dimensions of sustainability, taking the competitive approach of a firm towards the marketplace into account.</p> <p>The literature is lacking insight on how to manage the project portfolio (...) in relation to the sustainability.</p>	<p>Development of 5-step framework for integrating sustainability in the innovation project portfolio management process in the field of product development based on the assessment of various methods of project evaluation and selection</p>	<p>•Management of portfolio related to sustainability</p>	<p>X</p>
----------------------------------	--	---	---	----------

The key aspect of Table 6 and Table 7 could be interpreted as Sustainable Innovation Drivers. Literature suggests that the implementation of these aspects may foster the integration of Sustainability in the organisation activities. The literature also points out that Strategy, Management and performance are necessary to each other. For example, a Sustainable Strategy need the proper (environmental and social) indicators to evaluate if the goals are being achieved. Figure 12 is a graphical abstract to illustrate this idea.

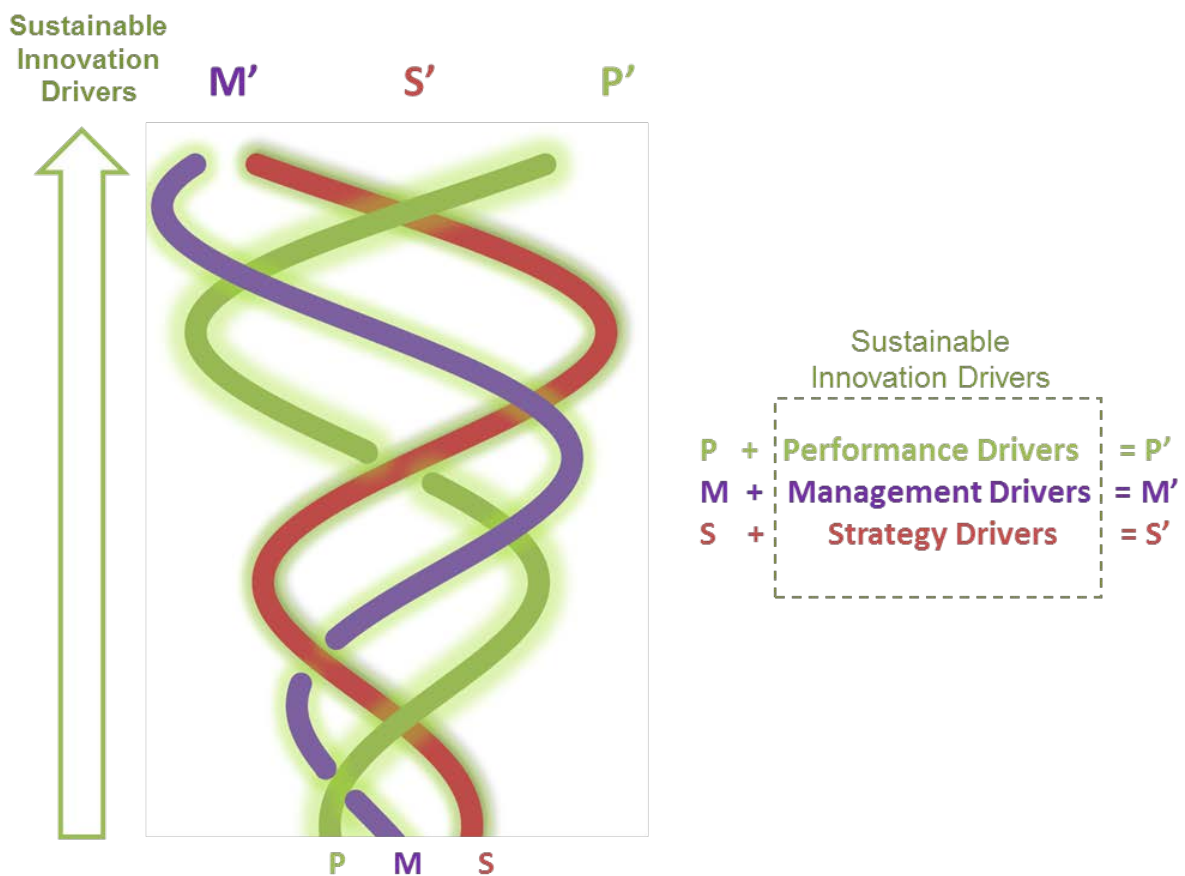


Figure 12 Conceptual model applied to the driver's action to generate new Strategy, Management and Performance

The traditional Performance, Management and Strategy become more social and environmental if the innovation drivers suggested in the key aspects of Table 6 and Table 7 are implemented.

2.2.1 Strategy Drivers

- Sustainability principles integration
- Stakeholders involvement
- Rethinking of business models

In order to relocate the iron-triangle of Project Management from profit dimension to sustainability dimension (Figure 13), where planet and people are taken into account, it is necessary to adopt a sustainable strategy. When a company decides to change its strategy to a sustainable one, it means that it will use sustainable innovation to improve internal processes. One of the critical processes into a company is the project management and it becomes necessary to create a sustainable project management, by including sustainable principles in the delivered project time and budget.

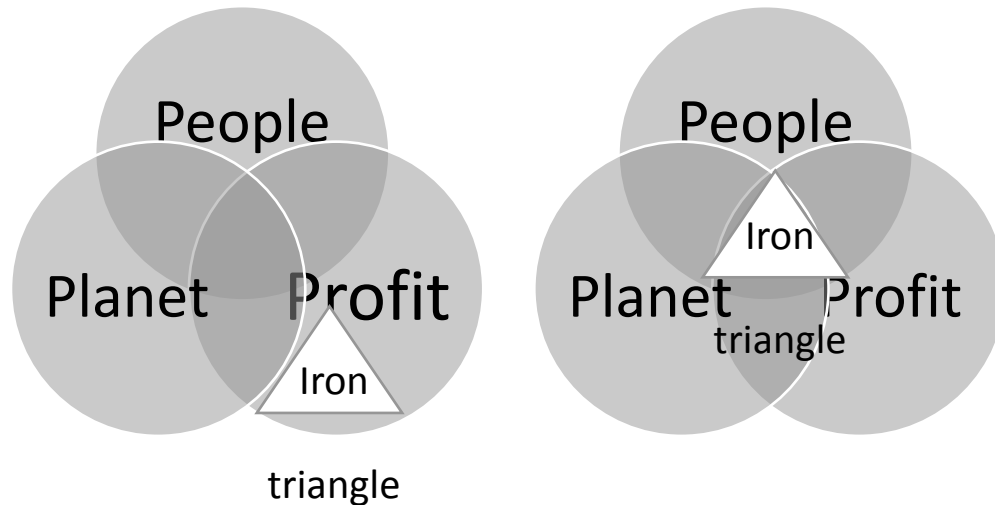


Figure 13 Left figure: Traditional alignment of the Iron Triangle with the PPP- Right figure: Sustainable alignment of the Iron Triangle with the PPP

Gareis (2009) maintains that to gain competitive advantage, sustainable principles must be integrated into the core of the organization. The inclusion of sustainability in the organization activities implies to consider a major change (Boons et al. 2013; Eccles, R. et al. 2013; Kiron, D. et al. 2013). The objective is to maximize the triple bottom line through Sustainable Innovation. (Stubbs, W. et al. 2008; Nidomolu, R. et al. 2009; Hall, J. et al. 2012; Schaltegger, S. et al. 2012).

To reach a sustainable maturity it is recommended to innovate step-by-step starting from the legal requirements, the supply chain, products/services and processes, and finally the business model (Nidomolu, R. et al. 2009).

In order to implement Sustainable Innovation, it is relevant to analyse the portfolio management. It is necessary to decide where the resources are going to be invested

(Brook, W. J. et al. 2014; Hansen E. G et al. 2009). The first step is to identify the most important ESG issues that matters to the company. Eccles, R. et al. (2013). The second step is to quantify the economic impact of this sustainability issues (Hall, J. et al. 2012; Stubbs, W. et al. 2008) The third step is to innovate in product, process and business model (Nidomolu, R. et al. 2009; Boons et al. 2013; Hall, J. et al. 2012; Verhulst, E. et al. 2012) Finally, these innovations have to be communicated, this means, a good management of stakeholders (Kiron, D. et al (2013) Lüdeke-Freund, F. (2009).

The Strategy Driver will influence the Planning Phase of the PMBoK concretely the Project Scope, Time, Cost, Quality, Human Resources, Communication, Risk and Stakeholder Management Knowledge Area. As Strategy is a pillar for the management of the projects it is clear, that the Strategy Driver affects most of the PMBoK areas.

2.2.2 Management Drivers

- Management of program/project related to sustainability
- Communication
- Training
- thinking dimension on sustainability
- Leadership necessary to implement sustainability

To get a Sustainable Project Management it is necessary to change the Management processes. In this area, it is important to make a sustainable innovation in

the communication field. The objective should be to reach a thinking dimension on sustainability of the stakeholders. (Kiron, D. et al (2013). The best way to get this change is through trainings. The top managers must inform about the changes and benefits of applying sustainability (Eccles, R. et al (2013). Their leadership activities should be aligned with the Triple Bottom Line objectives to promote the change (Stubbs, W. et al, 2008).

Studies (Silvius et all.) reveal that it is important to include the sustainability aspects since the beginning of the project. By applying the innovation from the initial phase of the project it enables the integration of sustainability in all the project's phases. This integration is reflected in the project resources, project delivery and the project output. It can be concluded that applying Sustainable Innovation from the initial phase of the project the integration of sustainability aspects will impact the scope and objectives of the project (Bocken, N.M.P. et al 2014).

In the case of the Management Driver, the mapping with the Knowledge Areas of the PMBoK will influence the Human Resources, Communication and Stakeholders Management Knowledge Areas. Regarding with the processes, this driver will affect the Executing Process Group of the PMBoK.

2.2.3 Performance driver

- Assessment

- Indicator set

It is necessary to measure the sustainability performance to identify the organization's sustainability level in order to define the possible improvements. (Eccles, R. et al (2013). The goal is to transform the Bottom Line to a Triple Bottom Line, this means, not just to measure the economic performance but also including the social and environmental performance, through innovation. (Kiron, D. et al, 2013); Hall, J. et al, (2012).

Sustainability is a new concept that does not have a standard and universal indicators set (Tam, Eskerod). The tendency is to use integrated reporting, this means, to include social and environmental information (Ebessen, Silvius, Gareis, Sanchez). By applying the transparency accountability, the stakeholders realize that Sustainable Innovation will influence positively in Environmental, Social and Economic issues.

This driver will impact the Project Scope, Time, Cost, Quality, Communication, and Stakeholders Management of the Areas of Knowledge of the PMBoK. The processes affected will be Planning, Monitoring and Controlling, and Closing Process of the PMBoK.

2.2.4 Sustainable innovation drivers and their influence in the change of paradigm proposed by Silvius

Silvius et al. (2012) state that the Traditional Project Management paradigm of controlling time, budget a quality is not realistic in complex changes and says that is necessary a Shift of Paradigm in ten areas.

After analysing the literature review, it is suggested that the Sustainable Innovation Drivers can contribute on this shift of paradigm. As it is represented in the following figures, the proposed idea is that the fact of implementing these drivers into the project management issues will push to a more Sustainable Development.

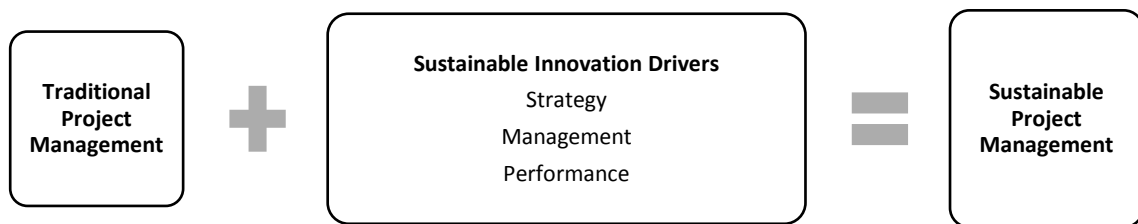


Figure 14 The paradigm shift from Traditional Project Management to Sustainable Project Management

The strategy drivers for sustainable innovation belong to the column of highlights codes in Table 6 and Table 7 and allow to relate the authors and their theories that could influence in the 10 areas proposed by Silvius. For example, in the case of “Business case of Sustainability”, Lüdeke-Freund, F. (2009) and Schaltegger, S. et al (2012) can provide some insights about how to change the time, cost and quality perspective to an economic, social and environmental one.

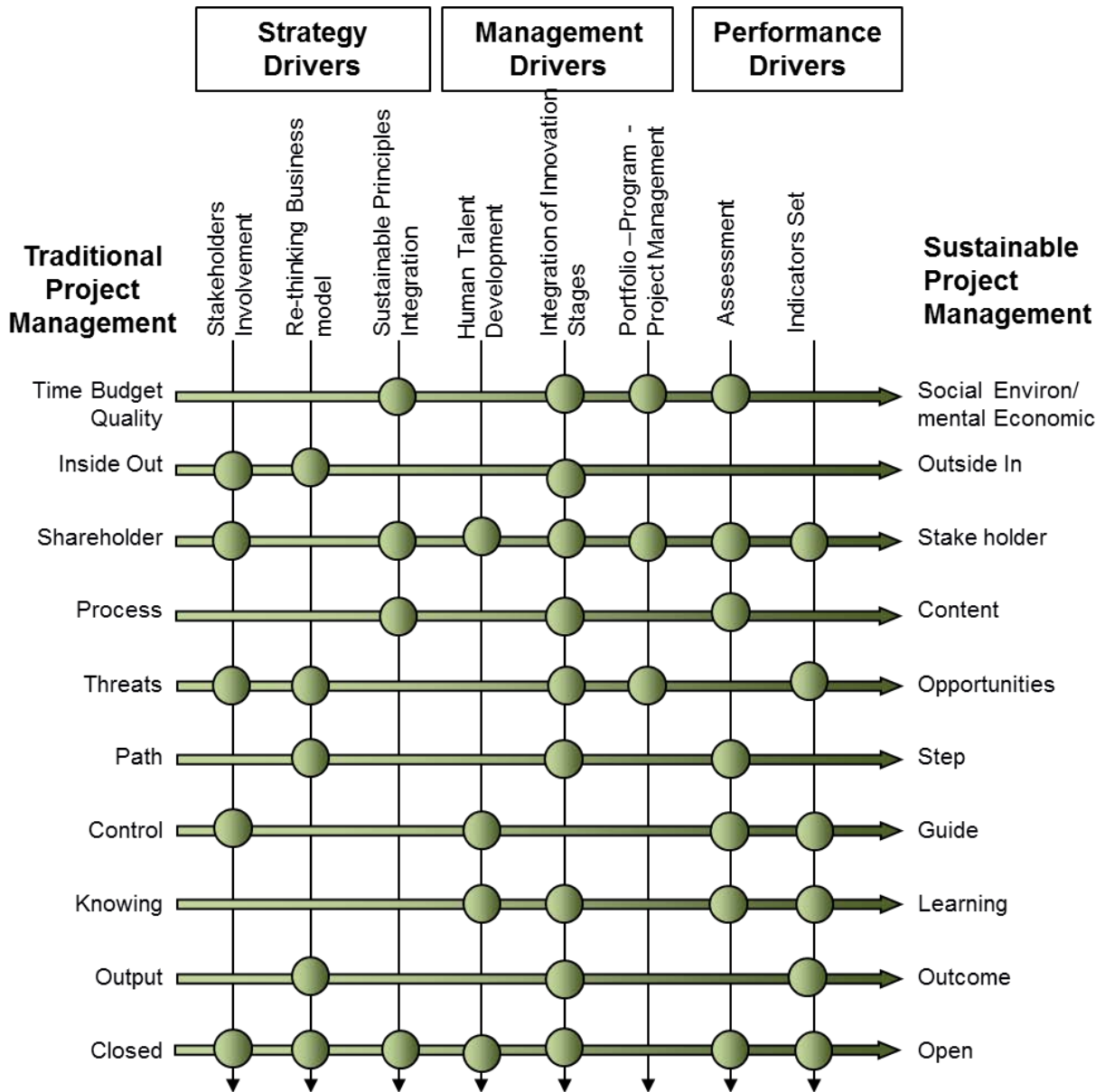


Figure 15 Drivers for Sustainable Innovation that allows the paradigm shift suggested by Silvius (2012)

2.3 Results: deductive approach

This section presents the results of a quantitative content analysis (Krippendorff, 2004) of the selected papers. In order to realize the quantitative content analysis, three models have been considered.

1. The sustainable project life cycle of Silvius (2010)
2. The business model for sustainable innovation (Boons and Ludeke-Freund, 2013)
3. The sustainable innovation drivers of the Section 3.2

The sustainable project life cycle model (Silvius, 2010) of Figure 16 is chosen because it considers strategy, management and performance in projects. And, the sustainable business models because connects the strategy and is oriented to the improvement of sustainable performance. The goal is to find in which aspects this two models are related.

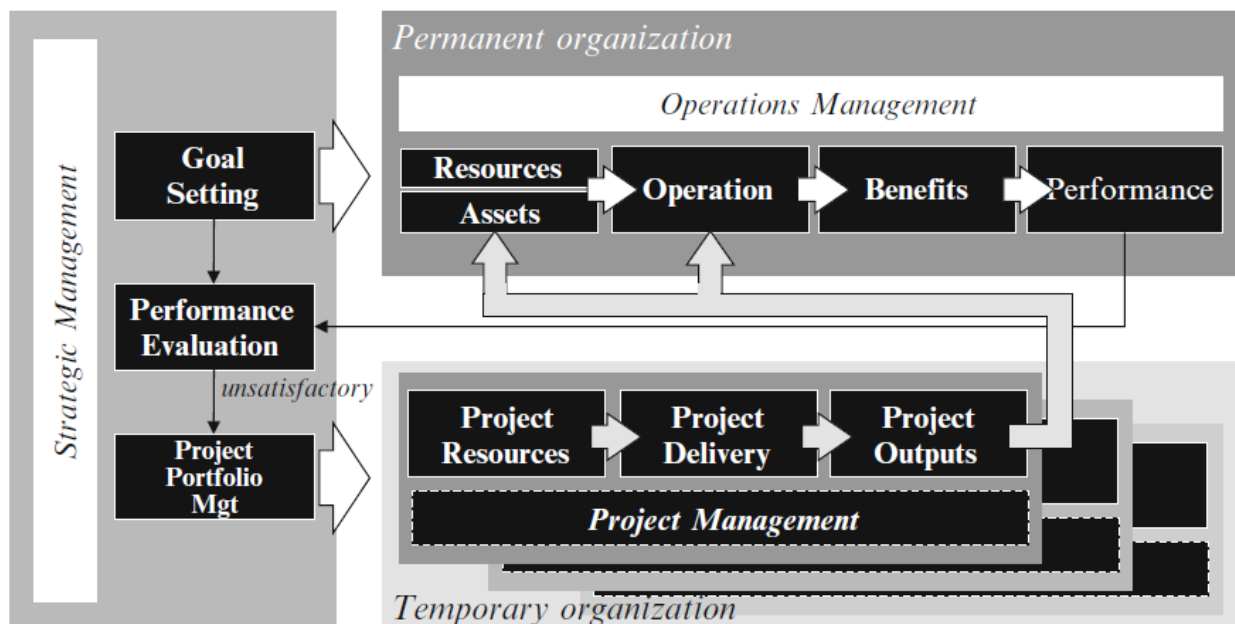


Figure 16 Sustainable Project Life Cycle (Silvius, 2010)

Silvius (2010) considers that projects, as temporary organizations, are linked to the strategy through the project portfolio management. The project outputs are linked to the permanent organizations and they have impact to the performance.

Boons et al. (2013) propose to use the concept of business models as a framework to focus the research on sustainable innovation. The analysis of business models involves assessing the way in which a firm combines a value proposition with supply chain management, the interface with customers, and a revenue model.

Osterwalder et al. (2009) state that a business model describes the rationale of how an organization creates, delivers, and captures value. The well-known model to explain these dynamics was created: The Sustainable Business Canvas (Figure 17).

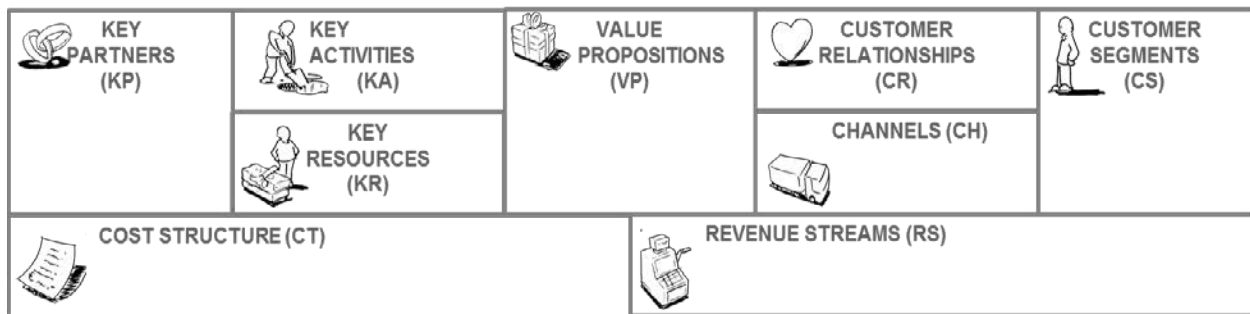


Figure 17 Sustainable Business Canvas. Source: (Osterwalder, 2009)

In the view of (Boons, Frank, Montalvo, Quist, & Wagner, 2013) SBM provides the conceptual link between sustainable innovation and economic performance at higher system levels. Boons et al (2013) define four normative requirements for business models to be met for successfully marketing sustainable innovation:

- The Sustainable Value Proposition (SVP) provides measurable ecological and/or social value in concert with economic value.
- The Sustainable Supply Chain (SSC) involves suppliers who take responsibility towards their own as well as the focal company's stakeholders.
- The Sustainable Customer Interface (SCI) motivates customers to take responsibility for their consumption as well as for the focal company's stakeholders.
- The Sustainable Financial Model (SFM) reflects an appropriate distribution of economic costs and benefits among actors involved in the business model and accounts for the company's ecological and social impacts
- These four requirements, labelled as SVP, SSC, SCI, SFM, influence several components of a business model. Figure 18 is a representation of the areas of impact according the view of Boons et al. (2013).

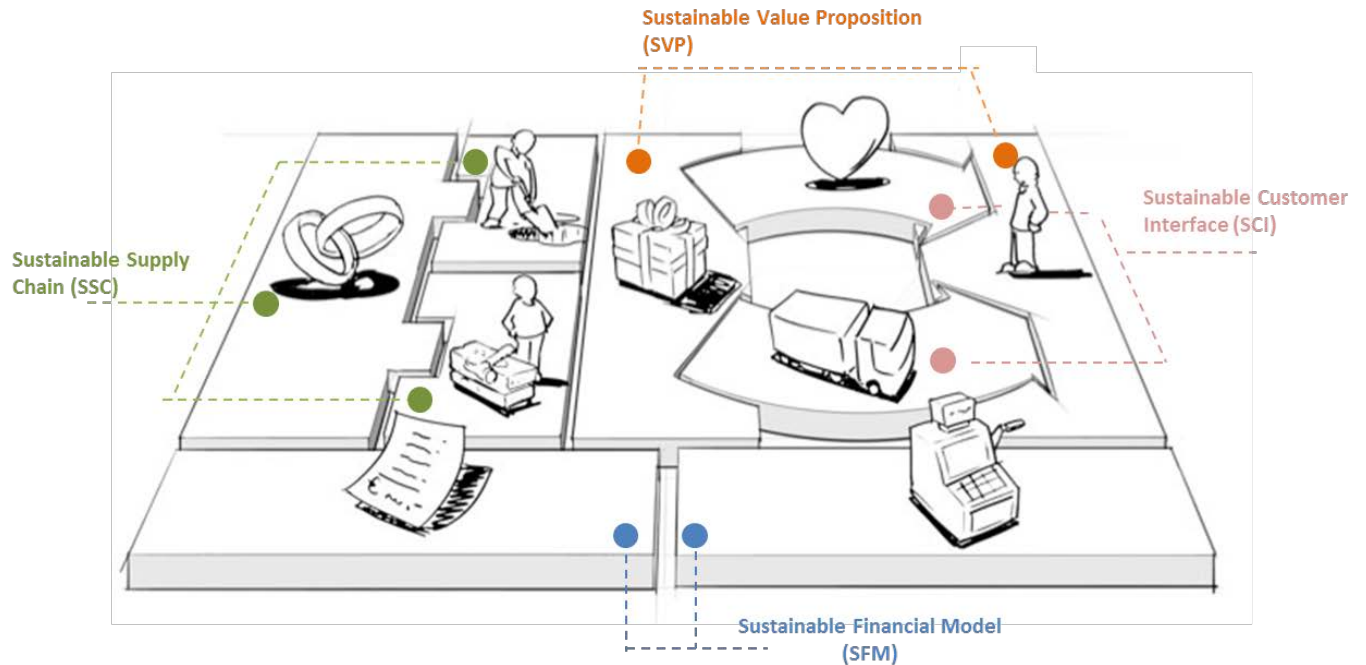


Figure 18 Sustainable innovation Requirements to be met by the Business Model Canvas. Source: Authors, based on (Boons, 2013; Osterwalder, 2009)

According to Krippendorff (2004), is necessary to create categories derived from the theory to analyse content. Figure 19 is a break-down diagram of the Sustainability in the Project Life Cycle of Silvius (2010) and Figure 20 is a break-down of the requirements of a Business Model for Sustainable Innovation proposed by Boons and Ludeke-Freund (2013).

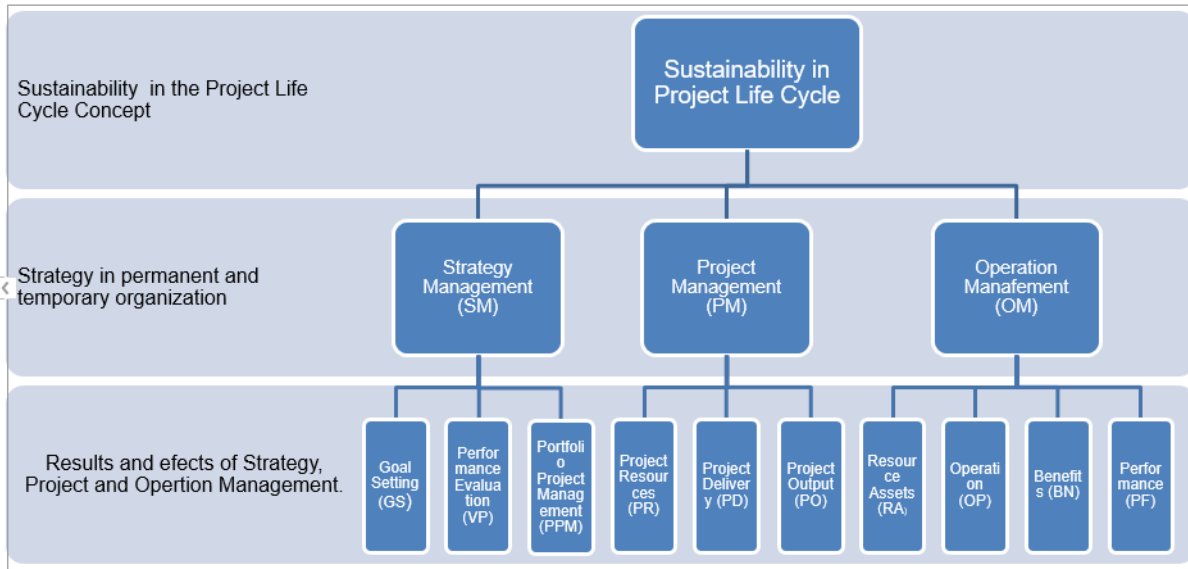


Figure 19 Categories and Subcategories of the Project Life Cycle Model (Silvius, 2010)

Each block also contains capital letters in parenthesis that will be used in the content analysis to gather the data.

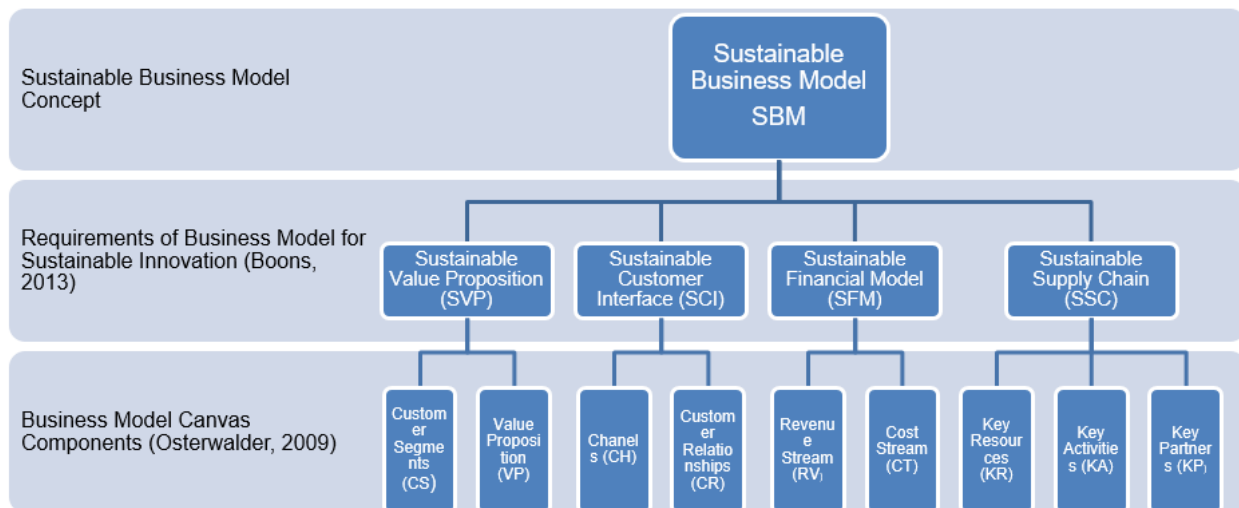


Figure 20 Categories and Sub categories of Sustainable Business Model (Boons and Ludeke-Freund, 2013)

The Sustainable Innovation Drivers derived from the literature review in section 3.2 are then mapped with both models Figure 21. For instance, in performance, the drivers

measure and track are related with sustainable value proposition (Boons and Ludeke-Freund (2013), and performance evaluation (Silvius et al., 2010).

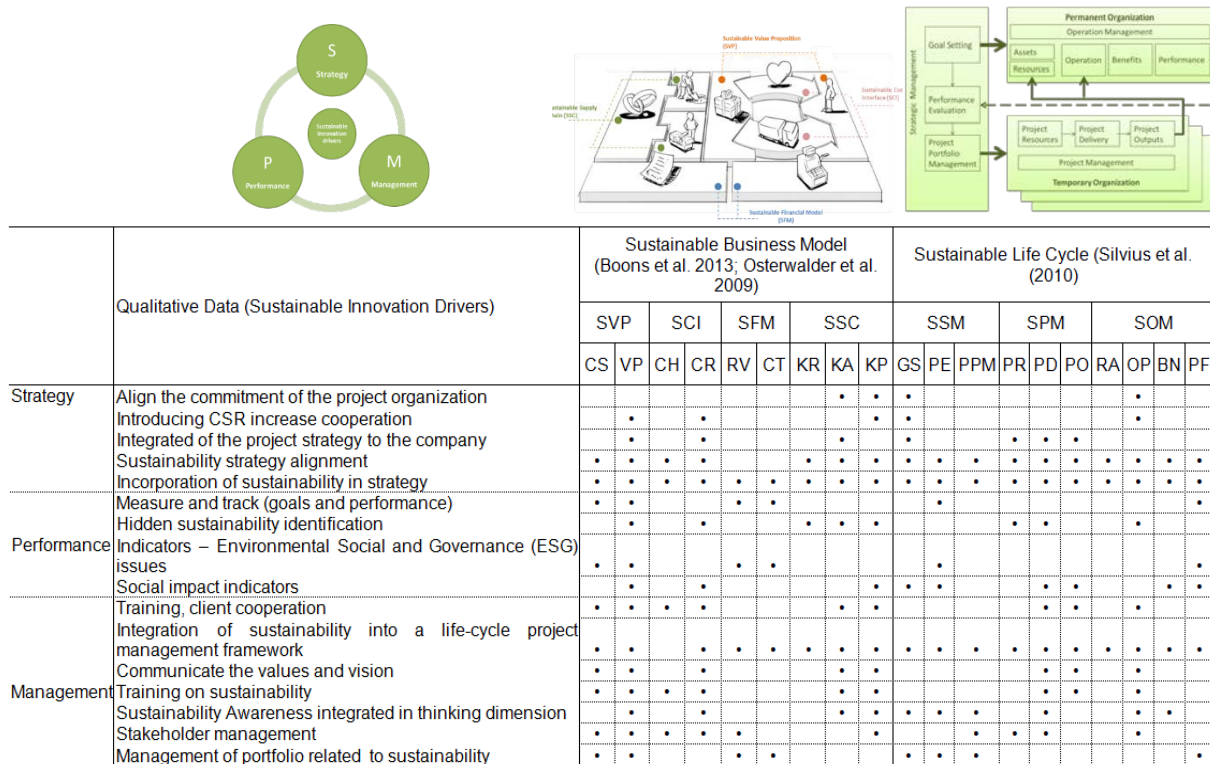


Figure 21 Content analysis of Project Life Cycle, Sustainable Business Models and Sustainable Innovation Drivers

3. Sustainable business model innovation

The business model represents the way in which an organization transforms resources to deliver and capture value. It serves as a tool of analysis in administrative sciences (Sommer, 2012). The business model implements in practice the vision of the company, connecting the strategy with the operational activities (Rauter, Jonker, &

Baumgartner, 2017). According to Zott and Amit (2008), the business model exists at the company level but also at other levels, such as at the project level (Wikstrom, Hellstrom, Artto, Kujala, & Kujala, 2009).

The sustainable business model concept represents the way in which an organization assumes sustainability as part of its own strategy. A sustainable business considers that its own survival depends on the well-being of the community that surrounds it, therefore, it creates shared value among several stakeholders while capturing economic value for its investors. The activities of a sustainable business model cause as little damage as possible or regenerate social, and natural capital (Bocken, Short, Rana, & Evans, 2014; Boons, Frank & Lüdeke-Freund, 2013; Schaltegger, Lüdeke-Freund, & Hansen, 2016; Stubbs, W. & Cocklin, 2008).

Geissdoerfer et al. (2018) compiled the main business model definitions proposed in the last decade, from the conceptualization of Stubbs and Cocklin (2008) to the definition put forward by Evans et al. (2017). Some of the elements common to all these definitions are: the integration of environmental and social activities, the consideration of globalization and localization processes, consideration of new stakeholders, the temporal impact, the use of indicators, the internalization of socio-environmental costs and the fundamental role played by innovation so that all these elements combine to create truly sustainable value (Boons, F. & Lüdeke-Freund, 2013).

Geissdoerfer et al. (2018) also distinguished four types of innovation in business models: start up, transformation in the business model, diversification in the business model and merge or acquisition of the business model.

Gauthier and Gilomen (2016) identified another typology based on how companies modify the elements of their business model. In their research, they analysed thirteen participating organizations in two sustainable urban projects. The results indicate that organizations mainly apply adjustments, innovation, and redesign in the business model. Adjustment occurs when a company makes small changes to one business model element, such as value proposition in order to participate in sustainability-oriented projects. Business model innovation is said to have occurred if a company modifies several of its business model elements, such as the supply chain and the consumer interface. Finally, redesign occurs if a company reconfigures all of the business model elements to deliver new value propositions to the market. This type of innovation depends to a greater extent on whether the company adopts accommodative, reactive, or proactive behaviour to gain a competitive advantage while providing sustainability (Schaltegger, Lüdeke-Freund, & Hansen, 2012).

Once companies have assumed that innovating the business model towards sustainability is a strategic decision that offers opportunities, the next question would be: how to innovate? In what part of the business processes should resources be invested to improve the capture and delivery of value? And further, what requirements should the

business model meet in order to innovate towards sustainability and, at the same time, be successful in the market?

Some of the most frequently cited answers to these questions are provided by Boons and Lüdeke-Freund (2013). They propose several requirements for sustainable innovation in each of the four main blocks of the business model: the value proposition, the supply chain, the consumer interface, and the financial model. Adopting the concepts of Boons and Lüdeke-Freund (2013) as well as those of Osterwalder and Pigneur (2010), several Business Model Canvases have been proposed. These include the Flourishing Business Canvas (Elkington, Rob & Upward, 2016), the Triple Layered Business Model Canvas (Joyce, Alexandre & Paquin, 2016) and the Circular Business Model Canvas (Lewandowski, 2016). The aim of these tools is to encourage companies to rethink the way in which they configure their activities to deliver value.

3.1.1.1 The Value Proposition for Sustainable Innovation

Bocken et al. (2014a) propose that one of the ways to innovate in value proposition is through the delivery of functionality, rather than product. In this model, the product is still important, but the owner of the product is not the customer, but the company. Whilst the customer would pay for the experience or use of the product, they would not pay for ownership. In this archetype some companies to manage all the physical assets that

customers would use and others may participate in the maintenance, repair, and upgradability of the goods.

As can be observed in Box 1, Boons and Lüdeke-Freund (2013) proposed two requirements that need to be met by the value proposition for sustainable innovation. The first requirement is that the value proposition has clear metrics of its ecological and/or social value. This is necessary because, as Veit et al. (2018) explain, customers demand more transparency in the process of creating and sourcing products. The information they receive has an impact on their perception of the firm's sustainability and hence their loyalty to the brand.

Box 1. Value proposition: Requirements for Sustainable Innovation.

“The value proposition provides measurable ecological and/or social value in concert with economic value. The value proposition reflects a business-society dialog concerning the balance of economic, ecological and social needs as such values are temporally and spatially determined. For existing products, a particular balance is embedded in existing practices of actors in the production and consumption system; for new products or services, such a balance is actively being struck among participants in the evolving alternative network of producers, consumers, and other associated actors” (Boons, F. & Lüdeke-Freund, 2013).

The second requirement is that a social dialogue exists and that this is reflected in a balance between the actors in the generation of the value proposition.

For the first requirement i.e., the existence of social and environmental metrics in the value proposition, it is necessary for companies to have integrated environmental management or accounting systems in their operations that record the data so that they can be transmitted to the end customer. For example, Phillip's "Pay per Lux" is a PSS performance model based on which customers pay for a promised level of luminance in a building (Van Ostaeyen, Van Horenbeek, Pintelon, & Duflou, 2013). In this type of business model, data management is necessary so that the customer is aware of consumption and the revenue of the company. Technological sophistication for storing information allows data to be collected and transmitted to the consumer (Huergo, 2006; Yang, Sun, Zhang, & Wang, 2017).

Authors such as Hockerts and Wüstenhagen (2010) argue that companies invest more in social dialogue because they are more exposed in large and diverse markets. In these companies, reputation is an intangible asset that they wish to protect and promote with innovation projects related to the community (Halme, Anttonen, Kuisma, Kontoniemi, & Heino, 2007), as well as with innovation projects that make it possible to adjust to legislative regulations in different environments (Santolaria, Oliver-Solà, Gasol, Morales-Pinzón, & Rieradevall, 2011) in order to avoid a bad image derived from legal

problems. Some ways of communicating sustainability-oriented innovation are, for example, eco labelling, corporate reports, indicators, etc.

A different type of dialogue comes from the client to the company, where the activity is more directed towards the local market, and is close or very specific, and in these cases it may be the client who takes the initiative to advise what innovations are needed (Evans et al., 2017). This type of dialogue is evidenced by the fact that some companies are reactive and make innovations at the customer's request. This makes sense, because having a B2C configuration, it is the customer who requests changes and turns the companies into a reactive rather than proactive operation. According to the taxonomy of circular business models, these companies optimize materials because they "produce on demand" (Lewandowski, 2016).

The next requirement of the value proposition for sustainable innovation is the evidence of a balance between the stakeholders involved in the value chain or the consumption. The purpose of creating a balance in consumption is to maximize the use of products through the sharing of underutilized products between the community or between companies, by, for instance, peer-to-peer collaboration of cars, energy, computers or clothing (Lewandowski, 2016). The use of technology platforms allows various types of organizations to participate in these models and the revenue is also shared.

3.1.1.2 *The Supply Chain for Sustainable Innovation*

Innovating in the supply chain is one of the first steps companies take on their way to sustainability (Eccles, R. G. & Serafeim, 2013; Klewitz & Hansen, 2014; Nidumolu, R., Prahalad, & Rangaswami, 2009). This strategy may arise from the obligation to comply with legislation, or from pressure from stakeholders. Companies also innovate in their supply chain to maximize material and energy efficiency, generate less waste, create less pollution, and reduce costs through the optimised use of materials (Bocken et al., 2014a; Klewitz & Hansen, 2014; Lewandowski, 2016).

As can be observed in Box 2, according to Boons and Lüdeke-Freund (2013), it is necessary to work with suppliers committed to sustainable innovation.

Box 2. Supply Chain: Requirements for Sustainable Innovation.

“The supply chain involves suppliers who take responsibility towards their own as well as the focal company’s stakeholders. The focal company does not shift its own socio-ecological burdens to its suppliers. This condition requires that a firm actively engages suppliers into sustainable supply chain management, which includes, for example, forms of social issue management and materials cycles that avoid/reuse wastes” (Boons y Lüdeke-Freund (Boons, F. & Lüdeke-Freund, 2013) p. 13)

Aguilar-Fernández and Otegi-Olaso (2018) demonstrated that size has a fundamental role when it comes to the sustainability oriented supply chain. Large companies and SMEs have different perspectives on partners (Lee, K., Go, Park, & Yoon, 2017). For SMEs, collaboration and coopetition are fundamental mechanisms in innovation towards sustainability (Bos-Brouwers, 2010; Cooke & Wills, 1999; Klewitz & Hansen, 2014; Nelson, 2004; Triguero, Cuerva, & Álvarez-Aledo, 2017; Uhlaner, Berent-Braun, Jeurissen, & de Wit, 2012; Walker & Preuss, 2008; Xue, Zhang, Wang, Skitmore, & Wang, 2018; Yoon, Shin, & Lee, 2016; Yun, Jung, & Yang, 2015). Thanks to the increased decision-making power of the owners, small businesses are dynamic and respond quickly to changing environments. However, unlike large companies, they lack the personnel with specific skills to innovate. Cooperation helps to overcome these limitations (Bos-Brouwers, 2010; Klewitz & Hansen, 2014), and to integrate external knowledge (Biondi, Iraldo, & Meredith, 2002; Song, Feng, & Jiang, 2017; Yun et al., 2015) in order to increase their capacity for innovation. Similarly, partnering helps SMEs to reduce costs in co-production (Nelson, 2004) and to obtain more profits, particularly when they are part of networks, R&D consortia, or innovation clusters together with brokers or technology institutes and universities (Halme et al., 2007; Yun et al., 2015).

On the other hand, authors such as Bouncken and Fredrich (2016) argue that large companies have more options for choosing suppliers. The greater the enterprise, the greater the density of the employee network, and its favourable position in the industrial

network gives it more bargaining power (Xue et al., 2018). According to Triguero et al. (Triguero et al., 2017) SMEs prefer to associate with large firms, because they perceive them as more stable for doing business, and exchange or cooperation activities are more reciprocal (Xue et al., 2018). Huergo (2006) also acknowledges the advantages of large companies due to their diversity of options, along with vertical or horizontal integration, but does not consider this factor to be determinant in the success of innovations for sustainability.

In SMEs, the lack of knowledge of new suppliers and the contraposition of objectives towards sustainable innovation can lead to the failure of innovation projects (Yoon et al., 2016). This is one of the reasons why SMEs prefer to ally with local and close partners (Bos-Brouwers, 2010; Uhlener et al., 2012). Veit et al. (Veit et al., 2018) consider that locality and sustainability are connected. The partnership between geographically close SMEs is beneficial because it can result in a decrease in energy consumption due to the transport of materials, it may solve labour and social problems close to SMEs, and it may activate local trade (Klewitz & Hansen, 2014).

Large companies need small companies as providers to make their supply chain more dynamic. SMEs, thanks to their organisational flexibility, can respond to the needs of large companies faster than the company itself, providing innovative or intermediate products to generate modular assemblies (Lee, K. et al., 2017).

The second requirement proposed by Boons and Lüdeke-Freund (2013) for a sustainable innovation-oriented supply chain, is that companies do not divert their socio-environmental duties to suppliers. In this respect, it is argued that larger companies can better manage their environmental impacts: they have EMS (Environmental Management Systems) in place, certifications and quality systems; they use indicators to monitor their activities (Johnson, 2015), manage waste, improve their energy efficiency (Klewitz & Hansen, 2014), prevent pollution in production, use alternative energies, and recycle (Yu, G. J., Kwon, Lee, & Jung, 2016). Large companies are more exposed and in order to reduce pressure from stakeholders, they need to be perceived as an organisation geared towards reducing negative environmental impacts. To lower manufacturing costs, large companies tend to outsource production, pollution and poor working conditions to suppliers located in developing countries, where sustainability regulations fail to protect the rights of society and the environment. However, today's media and social networks can quickly spread word of the problems originating at the manufacturing site and these become associated with the company that sells the product to the end customer. Veit et al. (2018) refer to this phenomenon as "association by guilt". Large companies are increasingly forced to extend to their suppliers the same sustainability parameters that their buyers desire.

SMEs are less subject to environmental regulations in comparison with larger companies. Their smaller organizational structure is not always compatible with the

formalities of an EMS or with quality protocols (Klewitz & Hansen, 2014). Moreover, due to their size, they produce a lower volume of waste and have less environmental impact.

3.1.1.3 *The Customer Interface for Sustainable Innovation*

The prestige of a company is an intangible capital that wants to maintain, or better still, increase when innovating for sustainability (Veit et al., 2018). As can be observed in Box 3, Boons and Lüdeke-Freund (2013) recommend that customers and stakeholders be encouraged to take responsibility for their consumption. For this, it is necessary for the company to know what could stimulate a client to participate proactively in the reduction of the socio-environmental impact of their own consumption. Lewadowski et al. (2016) and Bocken et al. (2014a) advocate the implementation of a take-back system in the business, so that customers return the products after first use. To achieve this, it is necessary that there is a change of attitude in the consumer, achieved through environmental awareness campaigns in which customers engage and know the full history of the manufacture of goods that are produced both locally and globally.

Box 3. Customer Interface: Requirements for Sustainable Innovation.

“The customer interface motivates customers to take responsibility for their consumption as well as for the focal company’s stakeholders. The focal company does not shift its own socioecological burdens to its customers. Customer relationships are set up with recognition of the respective sustainability challenges

of differently developed markets as well as company-specific challenges resulting from its individual supply chain configuration” (Boons, F. & Lüdeke-Freund, 2013)

The companies, being more exposed to public opinion, invest a great deal of effort into preserving the prestige of their brand in the face of sustainability (Uhlener et al., 2012). They also use resources to monitor patterns of change in the market. Customers prefer to participate in innovation projects with companies because if their brand is more known and reliable (Song et al., 2017).

Consumers want to feel that companies are taking responsibility for their pollution, even in the place of production. When this is not the case, the brand loses social capital, prestige, and market value (Uhlener et al., 2012; Yu, G. J. et al., 2016). With these risks in mind, and to avoid the association by guilt (Veit et al., 2018), companies invest more resources to innovate in cleaner infrastructure, by, for example, encouraging cleaner production, implementation of Environmental Monitoring Systems (EMS), innovative packaging, or awareness-raising campaigns for customers to return disused products for recycling by manufacturers.

3.1.1.4 Financial Model for Sustainable Innovation

As can be observed in Box 4, at least two requirements should be met in the financial model: Accounting for socio-environmental impacts and a fair distribution of

economic costs and benefits among actors in the value chain (Boons, F. & Lüdeke-Freund, 2013).

Box 4. Financial Model: Requirements for Sustainable Innovation.

“The financial model reflects an appropriate distribution of economic costs and benefits among actors involved in the business model and accounts for the company’s ecological and social impacts” (Boons, F. & Lüdeke-Freund, 2013).

One of the first initiatives to innovate towards sustainability is the implementation of Lifecycle costing since by virtue of valuing cost in environmental analysis it is possible to improve financial performance (Klewitz & Hansen, 2014).

According to Hockerts and Wüstenhagen (2010), large companies tend to innovate more towards the integration of environmental accounting systems. This criterion is shared by Johnson (2015) who argues that socio-environmental accounting and involvement in creating corporate reports are positively associated with the innovation of the financial model. For example, when a company accounts for its energy expenditure, it is more likely to have initiatives to save energy, save costs, have more financial benefits, and commit to innovation for sustainability (Uhlener et al., 2012).

Biondi et al. (2002) propose that to improve environmental performance a good alternative is to implement technological solutions either as environmental management software to account for impacts (Bos-Brouwers, 2010) or as organizational innovations

such as ISO or EMAS (Klewitz & Hansen, 2014). Lewandowski et al. (2016) go further, and propose that the existing metrics are insufficient for a sustainable future, and it is necessary to complement these with percentages of the income obtained from, for instance, repair, reuse, and second hand use.

The second requirement is the appropriate distribution of costs and benefits among the actors involved in the value chain. Although some companies attract long-term investors it is also true that profits are more committed to shareholders, and CEOs have less say in how they are distributed. In addition, some companies have more bargaining power vis-à-vis their suppliers and are therefore in a stronger position to take advantage in order to recover the economic benefits (Bouncken & Fredrich, 2016).

4. Project Management and Sustainable Development

There are several research initiatives for creating a common framework merging sustainable development and project management field. Some examples are the pursuit for an integrated model of sustainability and project management by University of Sao Paulo (Carvalho, Martens, Morioka, & Rabechini,), the PMI sponsored research project SustPM (Gareis, Roland, Huemann, & Martinuzzi, 2013), special journal issues ("Project management and sustainable development". A special issue of *sustainability* (ISSN 2071-1050); Eskerod, Pernille & Riis, Huemann & Silvius, 2017; Huemann & Silvius, 2017; Huemann & Silvius, 2017), conferences (Ingason & Schoper, 2017), books and standards

(Carboni, Gonzalez, & Hodgkinson, 2013; CASTALDO & REALE, 2011; Kohl, 2016; Maltzman & Shirley, 2012; Silvius & Tharp, 2013; Tam, Gilman CK, 2017). Structured literature reviews gather up this trend (Aarseth, Ahola, Aaltonen, Økland, & Andersen, 2017; Brones, de Carvalho, & de Senzi Zancul, 2014; Marcelino-Sádaba, González-Jaen, & Pérez-Ezcurdia, 2015; Martens, Mauro Luiz & de Carvalho, 2014; Martens, Mauro Luiz & de Carvalho, 2014; Økland, 2015; Otegi-Olaso, Aguilar-Fernandez, Fuentes-Ardeo, & Cruz-Villazon, 2016; Silvius, 2017), and even consider it as a new school of thought (Silvius, 2017).

Martens and Carvalho (2016; 2014), Aarseth et al. (2017) and Otegi et al. (2016) carried out the most relevant literature reviews in relation to our study. In 2014, Martens and Carvalho (2014) compiled a list of models in two areas: Corporate Sustainability Model and Sustainability Model for Project Management. They categorized aspects in the Economics, Social and Environmental dimensions. To name a few: the financial benefits of good social practices, innovation management, life cycle of products, environmental reports etc. They concluded that there is a need to create new constructs, factors or variables. Consequently, in 2016, Martens and Carvalho (2016) performed a new review, this time complemented by a survey to project managers. They found that one of the success factors for sustainability in project management was the Sustainable Innovation of Business Models.



Figure 22 Key factors of sustainability in Project Management Context (Martens, Mauro L. & Carvalho, 2016a);

Aarseth et al. (2017) identified in their literature review two distinct approaches: sustainability strategies adopted by project organization, and sustainability strategies adopted by project hosts. The two perspectives can also have mutual strategies. For instance, the sustainability emphasis in project portfolio management. It identifies in which projects to invest by selecting a framework or including sustainability at the very beginning of the project.

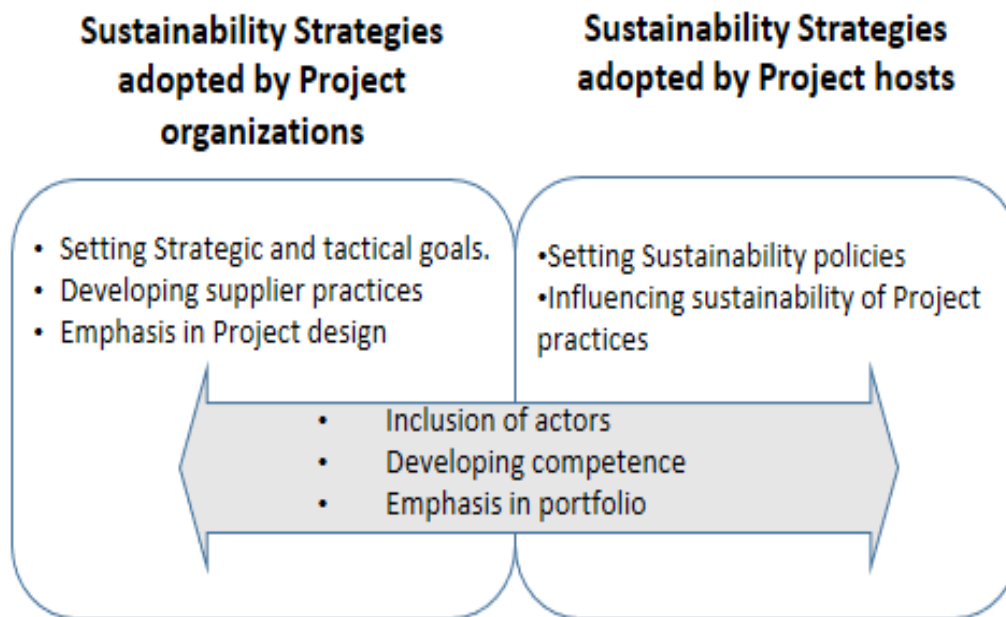


Figure 23 Project Sustainability Strategies (Aarseth et al., 2017)

On the other hand, Otegi et al. (2016) reviewed the state of the art and the commonalities between sustainable innovation and sustainable project management. They identified the main themes and classified the key aspects. Sustainability strategy, the alignment of commitment, the innovative rethinking of business model among others, were suggested as relevant to improve the transition from traditional project management to sustainable project management.

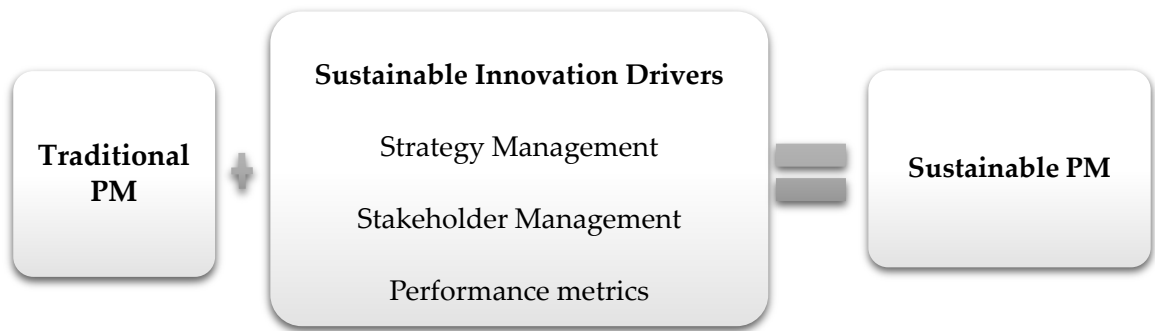


Figure 24 Innovation drivers: From traditional to sustainable Project Management (Otegi-Olaso et al., 2016)

Beyond the three literature reviews aforementioned, there are two conceptual papers with similar topics. In the first one, Keeys, Huemann and Turner (2013) purposed the relationship between the Corporate Sustainable Development (SD) Strategy and Project (SD) Strategy. The proposal reflects a cyclical alignment between both of them. The cyclical iteration is moderated by project understanding of SD, SD business case, stakeholder management, etc.

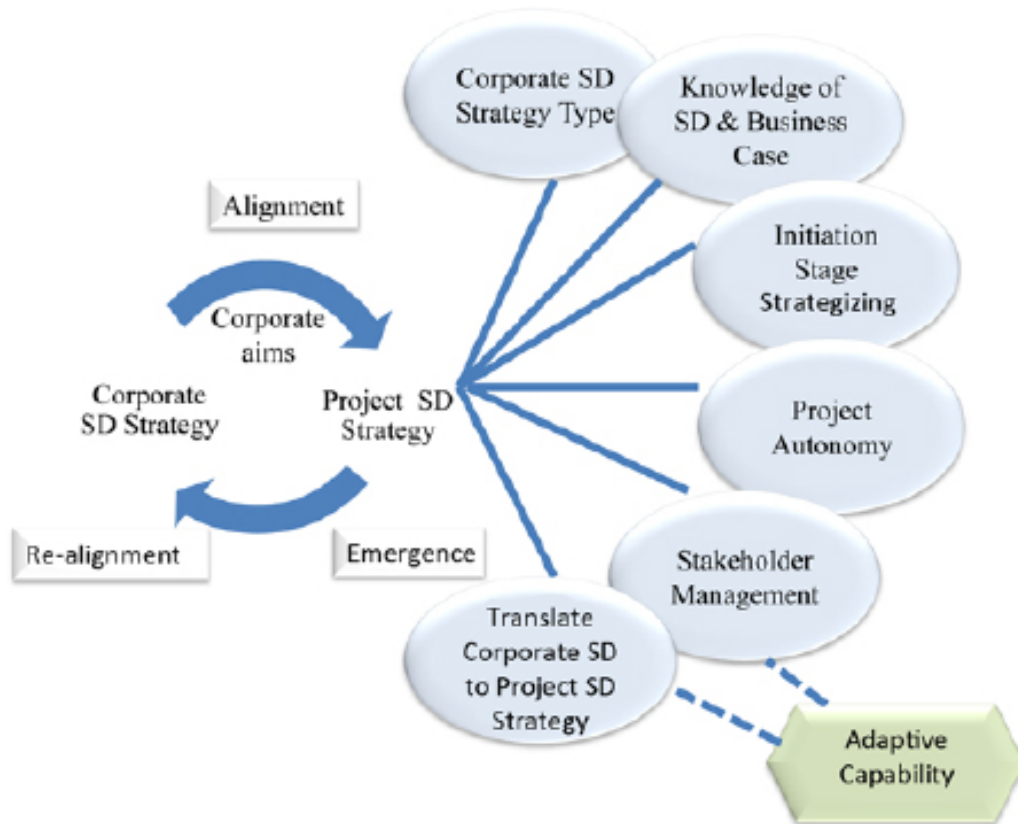


Figure 25 A cyclical-iterative approach to project SD strategy (Keays, Lynn A., 2014)

In the second paper, Silvius and Schipper (2017) compare the sustainability strategies of a Project Based Organization (PBO) and its clients. A PBO can integrate sustainability in a reactive or proactive way. In turn, a client may or may not demand the inclusion of sustainability. When combined, a matrix with 4 possibilities is built: Integration of sustainability by obligation, on request, as a competitive strategy or to create value.



Figure 26 Four Strategic Postures for Sustainability in projects of the PBO (Silvius & Schipper, 2017)

The empirical study of Brook and Pagnanelli (2014), applied to the automotive industry, encompasses many of the concepts discussed previously. These authors present a methodology to integrate the ecological, social and environmental aspects in the projects. The proposal consists of five steps: Strategic analysis, distribution of resources between types of innovative projects, evaluation of sustainability and mapping of projects, prioritization of innovative and sustainable projects, and finally management of performance (Figure 27).

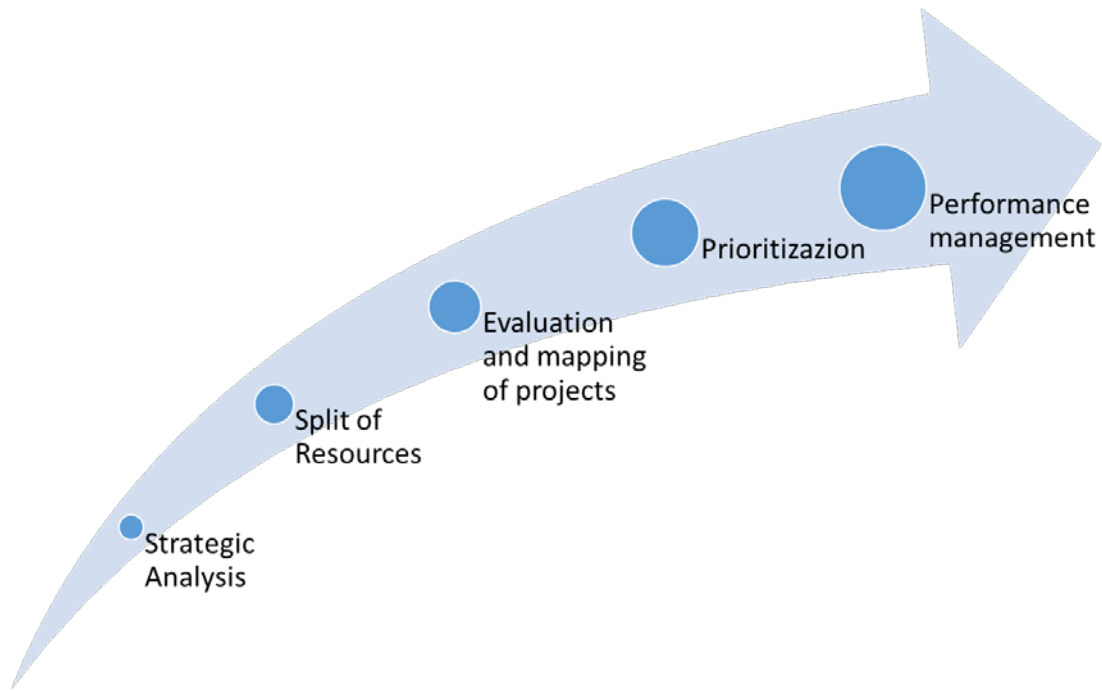


Figure 27 Framework for integrating sustainability in the innovation project portfolio management (Brook & Pagnanelli, 2014)

It is noteworthy that the strategy integrates from the beginning the aspects in which it is desired to improve, in this case, the emission of CO₂. In the second step, the amount of economic resources available in each type of project is decided. There are three types of, breakthrough, platform and derivative projects. In the third part, the evaluation, it is decided whether the innovation lies in improving the current product, in improving the production processes or in creating a new product. Likewise, the social criterion is based on satisfying the needs of the clients and specific problems in the short, medium and long term. Finally, the economic evaluation criterion is based on the market niche. For example, less innovative projects are aimed at saturated markets with no future to grow, moderately innovative projects are based on better production processes. The most

innovative and sustainable projects create new products, the financial returns are long-term, but they have the advantage of creating new market niches that will be expanding.

In the case of the automotive industry, they are classified in cars with improvements in diesel engines (less innovative and sustainable), the improvement of production processes and hybrid cars (moderately sustainable) and finally electric cars (more innovative and sustainable). Once the ecological and social aspects of the projects have been decided, the market niche and the type of return that they will have, priority is given to projects with quantitative indicators. The final step is to manage the performance of the projects in execution.

Although this study is specifically applied to the automotive industry, the methodology could be extended to other industries for several reasons: Integrates sustainability into the strategy, translates the strategy to every project, considers the ecological, social and economic aspects, applies sustainable innovation in the short, medium and long term, and defines the types of market it wants to reach.

However, Brook and Pagnanelli (2014) conclude that the breakthrough projects, despite being the most sustainable, are based only on a technological innovation. To be more complete, they should be accompanied by an innovation in the business model.

As it can be observed, sustainable innovation of Business model, Knowledge of SD & Business Case, stakeholder management and sustainability strategy at project level are

some of the core proposals to introduce Sustainable Development principles into to the Project Management field.

4.1 Sustainable project management: a tool for the transition to a sustainable business model

Changes in companies can be managed through projects (Gareis, R., 2010). Companies must respond to the demands of customers, competitors, environmental regulations, investors and society in general. Solutions such as product development, market development or organizational improvements can be the results of managing a chain of projects.

The implementation of sustainable concepts implies a change that is developed through projects. Companies go through several stages on their way to sustainability. They first meet the standards, then transform the supply chain, design sustainable products and processes, as well as new business models (Nidumolu, Ram, Prahalad, & Rangaswami, 2009). Each stage presents challenges and opportunities that can be managed by projects. For instance, recycling projects to create composite materials (Rybicka, Tiwari, & Leeke, 2016) or projects that implement strategies to reduce carbon emissions (Bocken & Allwood, 2012). Projects are also necessary to evolve in eco-design process (Ceschin, 2013; Prendeville, O'Connor, Bocken, & Bakker, 2017) and to offer integrated products-service systems (Brady, Davies, & Gann, 2005).

Socially responsible companies get on their path to sustainability by taking different voluntary initiatives, such as clean production, life cycle analysis, corporate reports, etc. (Lozano, Rodrigo, 2012). The implementation of these initiatives requires several processes: the feasibility analysis, planning, execution and start-up. These processes also belong to the life cycle of the projects (Labuschagne, C. & Brent, 2005), that is, they are part of a temporary organization (the project) that implements sustainability concepts either to modify the companies internally or to deliver a product or service to customers (Silvius, 2012). Some of the results can be the reduction of energy consumption, greater efficiency in the supply chain, improvement of the corporate image, or the opening of new markets with sustainable innovation projects (Brook & Pagnanelli, 2014).

Project managers are aware that traditional practices must shift to integrate environmental and social issues in the Project Management processes (Morris, P. W., November, 2017). Yet, there are some constraints that slow down the transition. For instance:

- Profit orientation. Traditional projects portfolio management seeks to maximize the financial return, while sustainability decisions are triple bottom line oriented (Elkington, John, 1998a). Senior managers often prioritize financial performance over environmental and social performance due to the demands of shareholders.

- Project lifespan. A project is a temporary organization. Sustainable Development (SD) is long-term oriented (Gareis, R., Heumann, & Martinuzzi, 2009), concerned with the impacts that can be seen after project completion (Labuschagne, Carin & Brent, 2005; Labuschagne, Carin & Brent, 2008).
- Stakeholders relationships. Projects are characterized by management-of-stakeholders, while sustainability is a management-for-stakeholders, including future generations (Eskerod, P. & Huemann, 2013; Silvius, 2012d).

Some investors are short-sighted, they look for short-term results in spite of externalized socio-environmental costs to society (Fatemi & Fooladi, 2013). Initiatives like cutting carbon-emission, making supply chains transparent, implementing energy management systems or protecting customer data (Seele, 2017), are not part of the agenda.

These contradictions of goals, between short-term projects and long-term SD goals, could be aligned via the management of programs and portfolios (Brook & Pagnanelli, 2014; Hope & Moehler, 2014). Project owners, investors and shareholders should also be aligned to support the initiatives from corporate level towards project level.

There are some strategies like improving the efficiency, reducing waste or eco-design products. All these imply sustainable innovation of processes, products or services

that can be implemented through project management (Brones et al., 2014; Marcelino-Sádaba et al., 2015; Prendeville et al., 2017). Nevertheless, the most effective way to boost simultaneously, the environment, social and economic performance, is the sustainable innovation of the business model (Boons, Frank & Luedeke-Freund, 2013; Eccles, R. G. & Serafeim, 2013; Kiron, David et al., 2013; Maltz, Bi, & Bateman, 2016; Nidumolu, Ram et al., 2009).

Business models are a representation of how a firm configures its activities to deliver and capture value. They are present at project level acting like a link between the strategy and operations (Wikström, Artto, Kujala, & Söderlund, 2010). The parent organization interacts with its project members by providing resources, delimiting goals and receiving products or services.

Concepts like supply chain, customer relationships, stakeholder dialogue or value creation are common in business models and project management. A project manager should interpret the business model of the project. It is necessary to understand the way on how it delivers or destroys sustainable value, and has to be aware of the current innovations that can be included in the processes. A program portfolio manager should have a very clear the sustainable strategy for the firm and translate it to projects via business model design. This would be useful for Project Managers in their decisions on how to integrate environmental and social issues at the investment and planning stages (Gareis, Roland, Huemann, & Martinuzzi, 2013), for making yes or no decisions

(Reginato, 2009) and to design the indicators that best fit to the particular triple bottom line of the firm and the project.

5. From project business towards sustainable project business

Anderson (2016) argues that Project Managers could have two perspectives on how to manage projects. The first perspective is about the tasks and the other is organizational. In the first, the project manager concentrates on specific activities, in the iron triangle and exercises a transactional leadership. In the second, the Project Manager focuses on the creation of value for clients, with transformational leadership, controls projects in a more holistic way. Sustainability must be integrated in both perspectives. However, the perspective on tasks, although necessary, is insufficient. Even if a task has come to an end, its impact is perennial in society and the environment. For this reason, this research opts for the organizational perspective and studies the projects as value providers, as suggested by Winter et al. (2006)

The Scandinavian school (Artto, Karlos A. & Wikström, 2005) aligned itself with this agenda and defined Project Business as "the part of business that relates directly or indirectly to projects, with a purpose to achieve objectives of a firm or several firms". Artto and Kujala (2008) proposed a research framework for Project Business. It consisted of four quadrants. The first quadrant, Project management. A Project is studied within a firm. In the second quadrant, a project is studied within several firms. In the third

quadrant, several projects are studied within a single firm, and, finally, in the fourth quadrant, several projects are studied, running within several firms (fig 2.a),

	One Firm	Many Firms
One project	1. Management of a project	2. Management of a Project Network
Many Projects	2. Management of a Project Based Firm	2. Management of a Business Network

Figure 28 Project Business as a Research Field (Arto, K. & Kujala, 2008)

From this proposal, the Scandinavian school formed the research group PB Research Group (Aaltonen, 2015), which has contributed with several publications where the components of the business model have been used to evaluate how projects shape their activities, the impact they have inside and outside the organization, as well as the success of the results. Table 8 lists 5 studies that use the business model as an analytical tool at the project level (Kujala, S., Arto, Aaltonen, & Turkulainen, 2010; Kujala, Saara et al., 2011; Mutka & Aaltonen, 2013; Reginato, 2009; Wikstrom et al., 2009). Column 2 of the

Table 8 specifies the objective of using the project's business model as unit of analysis. In column 3, what elements of the Business Model have been used in the research and finally in the fourth column, the reference authors (Chesbrough & Rosenbloom, 2002; Hedman & Kalling, 2003; Magretta, 2002; Morris, M., Schindehutte, & Allen, 2005; Osterwalder, 2004; Tinnilä, 2007; Zott & Amit, 2008).

Table 8 The use of Business Model as analytical tool at Project level

Authors in PM Research	Objective of the Analysis	Components of the Business Model	Theory based on
Reginato (2009)	Select the best projects based on the presence and robustness of the components of the business model	<ul style="list-style-type: none"> - Value Proposition - Market Segment - Cost Structure & Profit Potential - Value Chain - Value Network - Competitive Strategy 	Chesbrough and Rosenbloom (2002)
Kujala (2010; 2011)	Identify business model Typology of Projects and assess their performance	<ul style="list-style-type: none"> - Customer - Value Proposition - Competitive Strategy 	Chesbrough and Rosenbloom (2002) Magreta (2002) Morris et al. (2005)

	Identify what factors influence the choice of projects, according to their Business Model	<ul style="list-style-type: none"> - Position in the Value Network - Suppliers Internal Organization - Logic of revenue generation 	Tinnila (2007)
Wikstrom et al. (2009)	Comparison of project-level BM, project network and firm network	<ul style="list-style-type: none"> - Value and flexibility - Organization Innovation and growth - Competences and assets - Relationships and Collaborations 	Chesbrough and Rosenbloom (2002) Magreta (2002) Hedman and Kalling (2003) Morris et al. (2005) Zott and Amit (2008)
Mütka and Aaltonen (2013)	- Assess the impact of project-level at firm-level BM	<ul style="list-style-type: none"> - Offering Resources and capabilities - Internal Organization and activities - Revenue creation Logic - Customer 	Chesbrough and Rosenbloom (2002) Osterwalder (2004) Hedman and Kalling (2003)

-
- Value Proposition
 - Value Network
 - Competitive Strategy
-

Reginato (2009) studied 2 companies and used the business models tool to compare which projects would contribute more value to their firms. Kujala et al. (2010) argues that, although business models tend to look at the company in a global way, Zott and Amit (2008) also recognize that a company can have several business models within its structure. But what happens for example in a project-based organisation? In this case Kujala et al. (2010) say that it is necessary to analyse the business model of each project. To demonstrate their postulate, Kujala et al. (2010) made a case study about a company with five projects. Each project is analysed with the elements of the business model and in the results, they suggest several typologies of business model. To their criteria, with this form of analysis, the performance of a project can be evaluated. The more oriented it is to the client's processes and less to the delivery of a product, the project will be more successful. In a later work, Kujala et al. (2011) uses the same methodology to analyse 4 new projects with 3 types of deliveries and observed the impact they have on the client's strategy.

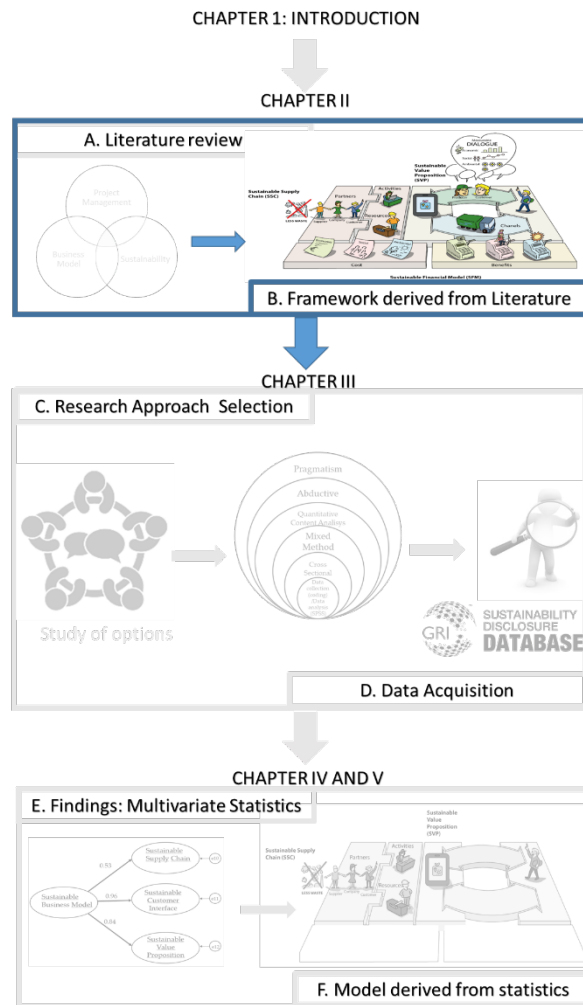
Wikstrom et al. (2010) extended Kujala et al. (2011) and analysed 19 projects, in several areas of Project Business. Concludes that business models exist in projects, in project networks, and in networks of firms. Likewise, Mutka and Aaltonen (2013) used business models to know to what extent the projects followed the strategy of the company.

Continuing with the methodology of the authors in Table 8, for this study we adopted the business model as an analytical tool to understand the behaviour of the projects. To date, all analyses of the business model at the project level are based on the traditional business model. However, the objective of this research is to evaluate projects from sustainability, therefore, it is adopted the sustainable business model as an analytical tool, also known in the literature as a business model for sustainability (Peric, Durkin, & Vitezic, 2017) business models oriented to sustainability or more sustainable business models (Lozano, R., 2018).

6. Framework

The business model is present at the project level, connecting the strategy and the operational level (Rauter et al., 2017; Wikström, Artto, Kujala, & Söderlund, 2010c). According to Boons and Lüdeke-Freund (2013), there are at least four elements that must be modified to achieve a successful business model for sustainable innovation: value proposition, customer interface, supply chain and financial model. In Project

Management, progress has been made in the four areas, however, contrary to studies in traditional project management, the four elements have never been studied together as a whole. Our proposal aims to fill that gap with a quantitative analysis. By using the elements of the business model to review projects, it will be possible to assess how firms deliver sustainability to their stakeholders.



Thesis Navigation Map 3. Framework derived from the Literature Review

6.1 Sustainable Value Proposition at Project Level

The value proposition is the solution or product that a company provides to the client to meet their needs. The client must know the cost of the proposal, as well as the economic and socio-environmental benefits. But this information must be measurable (Joyce, A. & Paquin, 2016; Lüdeke-Freund & Dembek, 2017). For example, the customer must know how much the product cost on a monetary level, its ecological footprint, whether the product is imported or local. The consumer should be informed if is being part of a fair trade market that promotes the social economy. In addition, the consumer should be informed about the recycling options.

To answer these questions, Tam (2010) proposes a pre-project and post-project evaluation. Tam (2010) considers that this evaluation is a cycle that draws on the value delivered by previous projects. Tam (2010) proposes to create evaluation indicators in the three dimensions, for example, the maximization of recyclable resources and the minimization of non-reusable resources, the care of biodiversity, the preservation of cultural heritage and opportunities for local people with less privileges. With these indicators, the Project Manager can make better decisions.

Once the delivery of the project is measurable, the following is to communicate it to the stakeholders. Mathur, Price and Austin (2008) emphasize that the project manager should create an atmosphere of dialogue, consensus and collaboration. This allows a

transparent evaluation of the activities and creates a social learning of what has been created in the project.

The dialogue with stakeholders should also represent the challenges in sustainability to be overcome with commitment and balance of responsibilities (Meech et al., 2006). This means that if affected stakeholders are listened to from the design of the project scope, there is a greater likelihood of success (Eskerod, P., Huemann, & Ringhofer, 2015). The value and expectations of the output would thus include the principles of sustainability from the initiation process. Keeys and Huemann (2017) define this process as co-creation of benefits in projects.

6.2 Sustainable Supply Chain at Project Level

Labuschagne and Brent (2005) describe the relationship between the life cycle of the project with the life cycle of the assets and the life cycle of the products. These relationships are relevant because they describe the sustainable impact even after the closure of the project. They claim that the project is limited to a period of time and resources, until the asset becomes operational. Later, when the asset is in operation, the manufacturing and the life cycle of the product begins. Consequently, the project is related first to the assets and these in turn to the products. The social and environmental impact are born with the project but continues in time. This is the reason why Brones, Carvalho and Senzi (2014) propose the integration of environmental aspects in project

management processes aimed at the ecological design of products. In this way, the project management could plan the use of efficient materials for the execution, control, closure, use and recycling phases.

The principle of sustainability in project management "Sustainability has a global and local orientation" should be reflected in the origin of the products. This principle should take into account working conditions in distant countries, as well as opportunities for nearby suppliers (Gareis, R. et al., 2009; Silvius, 2012e).

There are mechanisms for project management to generate social value in the supply chain. One of them is the acquisition of goods and services to social enterprises. The hiring of companies that generate employment for disadvantaged or marginalized groups, such as long-term unemployed, ethnic minorities, disabled or ex-convicts, is one of the practices that some governments encourage in projects to generate social value through the supply chain (Loosemore, 2016).

6.3 Customer Interface at Project Level

Silvius and Schipper (2017a) consider that projects and clients can have reactive or proactive strategies in the face of sustainability. If the project strategy is active, and the client's strategy is passive, sustainable value is generated. However, when the client has a proactive strategy in the face of sustainability, this becomes a competitive advantage for the project. That is why, from the management of the project, stakeholders must be

motivated to participate in sustainability choices and also take responsibility for their consumption.

Traditional standards in project management, such as ICB, PMBoK or PRINCE2 do not consider the principles of sustainable development in stakeholder management (Eskerod, Pernille & Huemann, 2013). As an alternative, Eskerod et al. (2015) propose to introduce "management for stakeholders", which recognizes not only clients, but also each group with legitimate interests and the right to have their expectations about sustainability recognized. Relating project processes to stakeholders means creating commitment within a social learning environment. Those involved could know to what extent they should be responsible for the costs and be participants in the economic, social and environmental benefits generated by the project (Keeyes, Lynn A. & Huemann, 2017; Meech et al., 2006).

6.4 Financial Model at Project-level

Sustainability in the financial model deals with two key aspects: the appropriate distribution of benefits and the triple bottom line. For a project to be sustainable, the benefits must endure over time, inside and outside the organization, and must be distributed in a clear and fair manner with society. In the same way, the accounting performance of the triple bottom line should reflect the minimization or elimination of negative externalities of the project.

Regarding the fair distribution of benefits in projects, some studies on the direction of PPP projects have described the advantages of generating fair concession periods between governments and companies to satisfy all stakeholders. This win-win situation also distributes the risks equally and avoids costly renegotiations (Carbonara, Costantino, & Pellegrino, 2014). Other studies, such as that of Wang and Liu (2015), suggest that governments develop a preference for investors who have proven to be guided by principles of justice in the sharing of surplus profits in projects. These project promoters put aside short-term financial performance, to give way to financial value based on building trust. Smyth et al. (2010) state that trust creates potential for new projects.

Regarding the second point, the triple bottom line, to keep an accounting that integrates the principles of sustainable development, it is necessary to create indicators in the planning phase of the project. This step, necessary before the investment, serves to have a starting point. Talbot and Venkataraman (2011) recommend reviewing the temporal and spatial limits of the project, making a breakdown of activities and having a general list of indicators as a reference (for example GRI indicators), to be assigned to each phase of the project.

Each indicator, besides being measurable, must have assigned stakeholders. After doing a stakeholder analysis, it is possible to know who each indicator affects, as well as

who should be responsible for minimizing the negative impact and maximizing the positive impact.

Sustainable companies see the need to communicate their project initiatives to stakeholders and investors in a measurable way (Schieg, 2009). Some authors have proposed indicators to quantify sustainable performance at the corporate level and at the project level (Keeble, Topiol, & Berkeley, 2003; Labuschagne, Carin, Brent, & Van Erck, 2005; Talbot & Venkataraman, 2011), however these authors acknowledge the limitations of these indicators to clearly reflect sustainable initiatives. In the context of a project, sometimes the standard indicators are not applicable. Those responsible for planning the project may overlook important aspects that are evident in the execution, which is why it is necessary to listen to the opinion of the stakeholders when designing the indicators. A good case study in Project Management on the identification of the impacts of a project from the social point of view is that carried out by Xue et al., (2015). They were able to identify which were the biggest problems that affected citizens during the construction of a metro. Indicators such as, for example, the duration of water, electricity, or gas service interruptions; the need for new parking lots, the extra time traffic diversions take, or the extra costs that those using public transport must take during the construction of the metro. This type of indicators is specific to the project, can be subject to measurement and have a direct effect on the quality of life and satisfaction of residents.

Table 9 summarizes the concepts of the framework. The first column contains the 4 elements of the business model at the project level that are analysed in this study. The second column contains its definition and the authors from the vision of Project Management. The third column contains the category name of each definition.

Table 9 Framework for the Analysis of Sustainable Business Model at project level

Blocks	Definition and Project-level references	Category Name
Value	The value proposition provides to the project	MV
Proposition	users and sponsors a measurable ecological and/or social value in concert with economic value (Abidin & Pasquire, 2007; Al-Saleh & Taleb, 2010; Keeys, Lynn A. & Huemann, 2017; Lee, S., Cho, Choi, & Yoon, 2017; Martinsuo & Killen, 2014; Tam, Gilman, 2010)	(Measure Value)
	The project management reflects a project-stakeholders dialogue concerning the balance of economic, ecological and social needs as such values are temporally and spatially determined. There is a management-for-stakeholders. The engagement is	SD (Social Dialogue)

promoted. (2013; Eskerod, Pernille & Riis, ; Eskerod, Pernille & Huemann, 2013; 2009; 2013; Gilbert Silvius, Kampinga, Paniagua, & Mooi, 2017; Lenferink, Tillema, & Arts, 2013; Mathur et al., 2008; Wang, Yang, Han, de Vries, & Zuo, 2016)

For project deliveries and project outputs a B (Balance) particular balance is embedded in the design, production and consumption. Such a balance is actively being struck among stakeholders (Brones et al., 2014; Hope & Moehler, 2014; Labuschagne, C. & Brent, 2005; Lenferink et al., 2013; Mathur et al., 2008; Meech et al., 2006; Turner, 2010)

Supply Chain Involves suppliers who take responsibility towards their own as well as the focal's company's stakeholders. Actors cooperate in the creation of sustainable value.(Keeyes, Lynn A. & Huemann, 2017; Labuschagne, Carin et al., 2005; Loosemore, 2016; Peenstra & Silvius, 2017; Turner, 2010) Inclusion of SD KA (Key Activities)

principles must be included in Project Knowledge , and Project Planning as well as the main tools that support the alignment to the strategy (Ebbesen & Hope, 2013; Hwang & Ng, 2013; Martens, M. L. & Carvalho, 2017; Scarpellini, Valero-Gil, & Portillo-Tarragona, 2016; Schieg, 2009; Yu, M., Zhu, Yang, Wang, & Sun, 2018)

Selection of suppliers with sustainability criteria. KS (Key Suppliers)
 No shift its own socio-ecological burdens to its suppliers
 (Gilbert Silvius et al., 2017; Labuschagne, C. & Brent, 2005; Zuo, Potangaroa, Wilkinson, & Rotimi, 2009)

Customer Interface Motivates project user to take responsibility for their consumption as well as for the focal company’s stakeholders. The sustainable output of the project ads competitive advantage to the company. (Aguilar-Fernandez, Otegi-Olaso, & Fuentes-Ardeo, 2016a; Brook & Pagnanelli, 2014; Turner, 2010) MC (Motivates Consumer)

The project delivery or project output do not shift its own socioecological burden to its customer (Knoepfel, 2010; Silvius, 2012e) NS (No shift)

Customer relationships are set up with recognition of the respective sustainability challenges of differently developed markets as well as project-specific challenges resulting from its individual project resources management (Aguilar-Fernandez et al., 2016a; Eskerod, Pernille & Riis, ; Gilbert Silvius et al., 2017; Lenferink et al., 2013; Mathur et al., 2008) CR (Customer Relationship)

Financial Model Appropriate distribution of economic, costs and benefits among stakeholders in project output and outcome (Keeyes, Lynn A. & Huemann, 2017; Scarpellini et al., 2016; Schieg, 2009) AD (Appropriate Distribution)

Accounts for the project's ecological and social impacts (Abdi, Taghipour, & Khamooshi, 2018; Labuschagne, Carin et al., 2005; Schieg, 2009; Xue et al., 2015) AI (Account for impacts)

7. Modification of Osterwalder (2004) canvas using the requirements for Sustainable Innovation

There is an emerging field with theoretical and practical contributions about sustainable business model. Lüdeke-Freund and Dembek (2017) identified new tools that support this assertion, like the triple layered canvas (Joyce, A. & Paquin, 2016), the strongly sustainable business model (Upward, Antony & Jones, 2016) or the flourishing business canvas (Elkington, Rob & Upward, 2016). In the same line, Schoormann et al. (2016) classified 22 graphical representations of sustainability in business models. The categories highlight the way in which the models change by:

- Adding new blocks
- Dividing blocks
- Modifying the block-content
- Modifying the structure or
- Linking elements (items or blocks)





This research also contributes with a graphical tool to complement the interpretation of the framework. To achieve this, we modify and connect the block content of the Osterwalder (2010) canvas. The symbols embedded are enriched according to the requirements for sustainable innovation suggested by Boons and Lüedeke-Freud

(2013). The main features are described in Table 10 and the modification of content from traditional to sustainable point of view is described in table:

Table 10 Modification of Osterwalder canvas according to Boons and Lüdeke-Freund requirements

Value Proposition	Customer Interface	Supply Chain	Financial Model
The use of technologies for servitization	The customer should be a proactive participant	The suppliers fulfil ecological and social requirements	The financial model consider accountability according the triple bottom line.
Clear measurability according the triple bottom line	The customer should be motivated to recycle the consumption	The key activities are highly innovative	The future generations should be considered in the cost and benefits of the firm operations
Social Dialogue, not only with the customer but also with other stakeholders	There should be a communication between the customer and the sustainable design of products/services	Promotion of gender and ethnic equality as well as social inclusion in the workforce	

Table 11 Modifications to the elements of Osterwalder's business model, considering the requirements of Boons and Ludeke-Freund (2013).

Sustainable	Traditional	Description
Element	Element	
		<p>The customers have a more active role in the sustainable business model. First, regarding to the opinion with the company, second by taking responsibility of the products their hand in their hands, trying to making them recyclable. The green pack means that the product should complete their lifecycle as much as possible within the parameters of a circular economy.</p>
		<p>On the other hand, the client is also located in the supply chain/design of the product because some innovative business model could require co-creation of the product/service</p> <p>The value proposition of new business models could be orientated to change ownership to services. The resources are not enough to maintain the current speed of resource consumption. Thus, new business model should be technologically, organizational or social</p>

innovative to cover the needs of customer. This would require changes in the interface with customer. For instance, sharing car/moto/bike platforms which cover the need of transportation without ownership, as well as crowdfunding among others.



The customer relationship should be based in a social dialogue, but the content of this dialogue include the environmental, social and economic measurable issues.



On the other hand, the sustainable business model not only have a customer relationship but also include different stakeholder's dialogues.

For the sustainable business model, the arrows between the value proposition and the customer are bidirectional, contrary to the traditional business model where they are one-direction.



The supply chain should be carefully taking into account since providers until customers. As most as possible trying not to produce waste, residues. The sustainable business model could also receive already used products for the clients in order to recycle.





The activities should be innovative and sustainable. This will require changes, dilemmas, research, and improvement of technology.



The key resources should be cared. Their safety is first and the genre inclusion taken into account as well as training in sustainability



A traditional business model only accounts for economical costs, and the environmental/social cost are produced but externalized to society and sometimes they don't even are aware the measure of the impacts. A sustainable business model account the impacts, try to reduce as much as possible and do not externalize the cost to society.



The triple bottom line is used in sustainable business model and are intended to be appropriate distributed for the different actors, (social and environmental) taking into account future generations.

Combining all the elements described in the previous sections, a modified canvas is proposed with the requirements for sustainable innovation in Figure 29 .

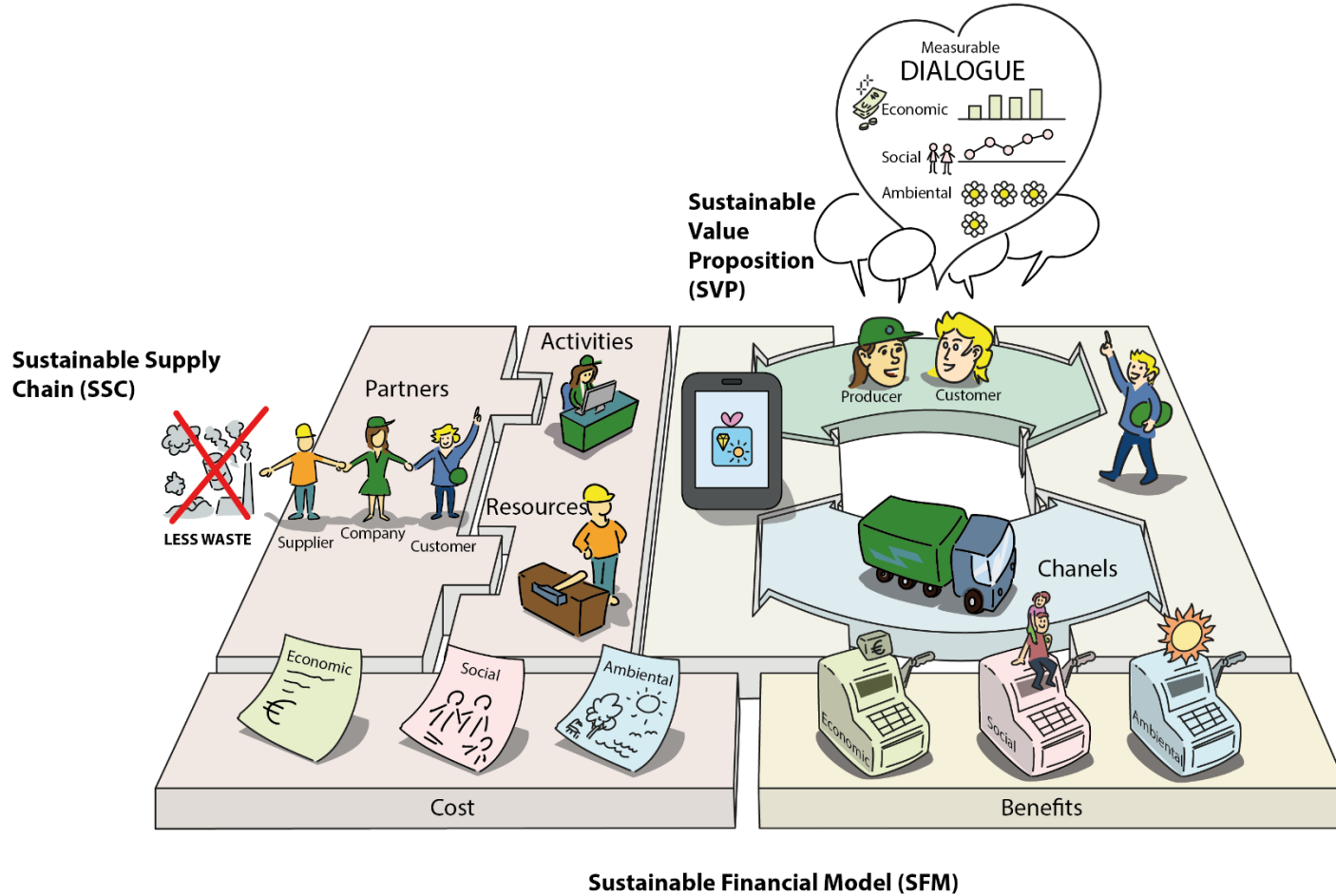
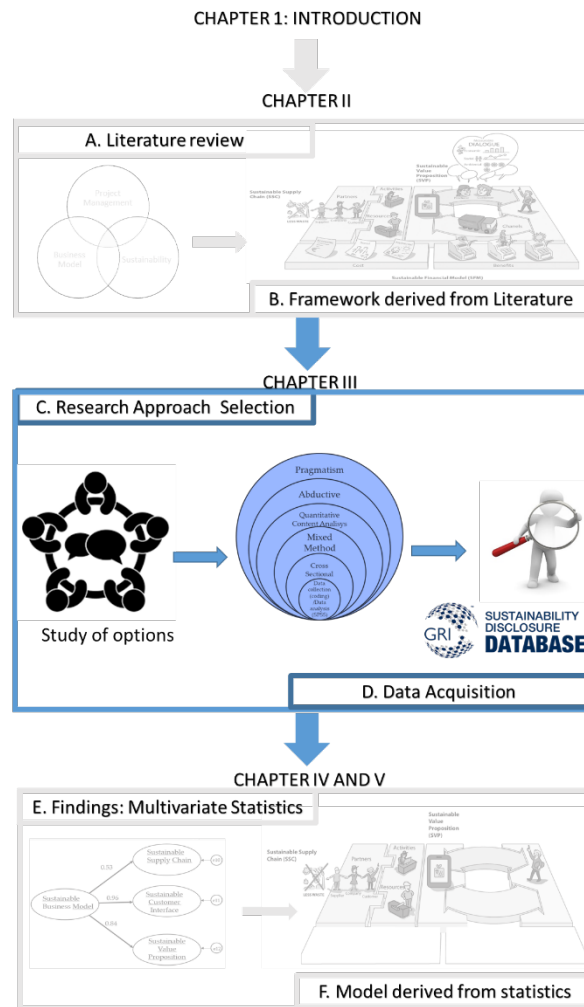


Figure 29 Business Model for Sustainable Innovation Canvas based on Osterwalder (2010) and Boons and Ludeke-Freund (2013)

III. METHODOLOGY



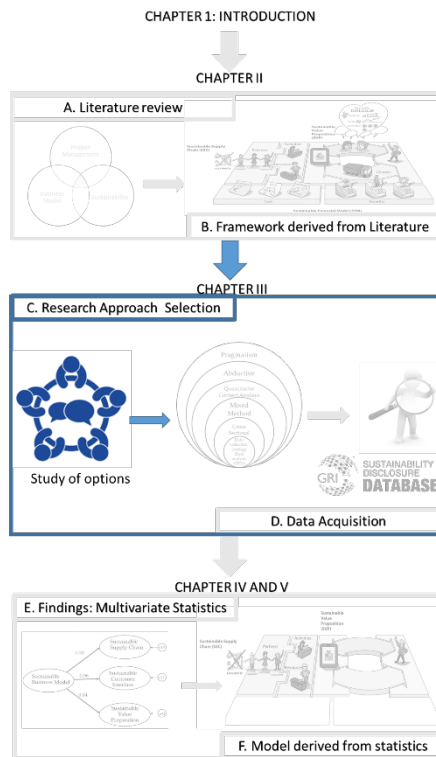
Thesis Navigation Map 4. Chapter II: Methodology

This chapter has three objectives. The first objective is to reflect on the philosophical and etymological paradigms of Sustainability and Project Management. This reflection allows to understand how knowledge has been created so far. That is to say, it is analysed the philosophical, epistemological paradigms and methods previously used by the researchers related to the goal of this thesis

The second objective is to explain the position used to carry out this thesis: constructivism as philosophical paradigm, abductive approach, mixed methods and quantitative content analysis.

The third objective is to describe the way in which the data have been obtained from the Corporate Reports of companies adhering to the Global Reporting Initiative (GRI).

1. Paradigms in Sustainable Project Management Research

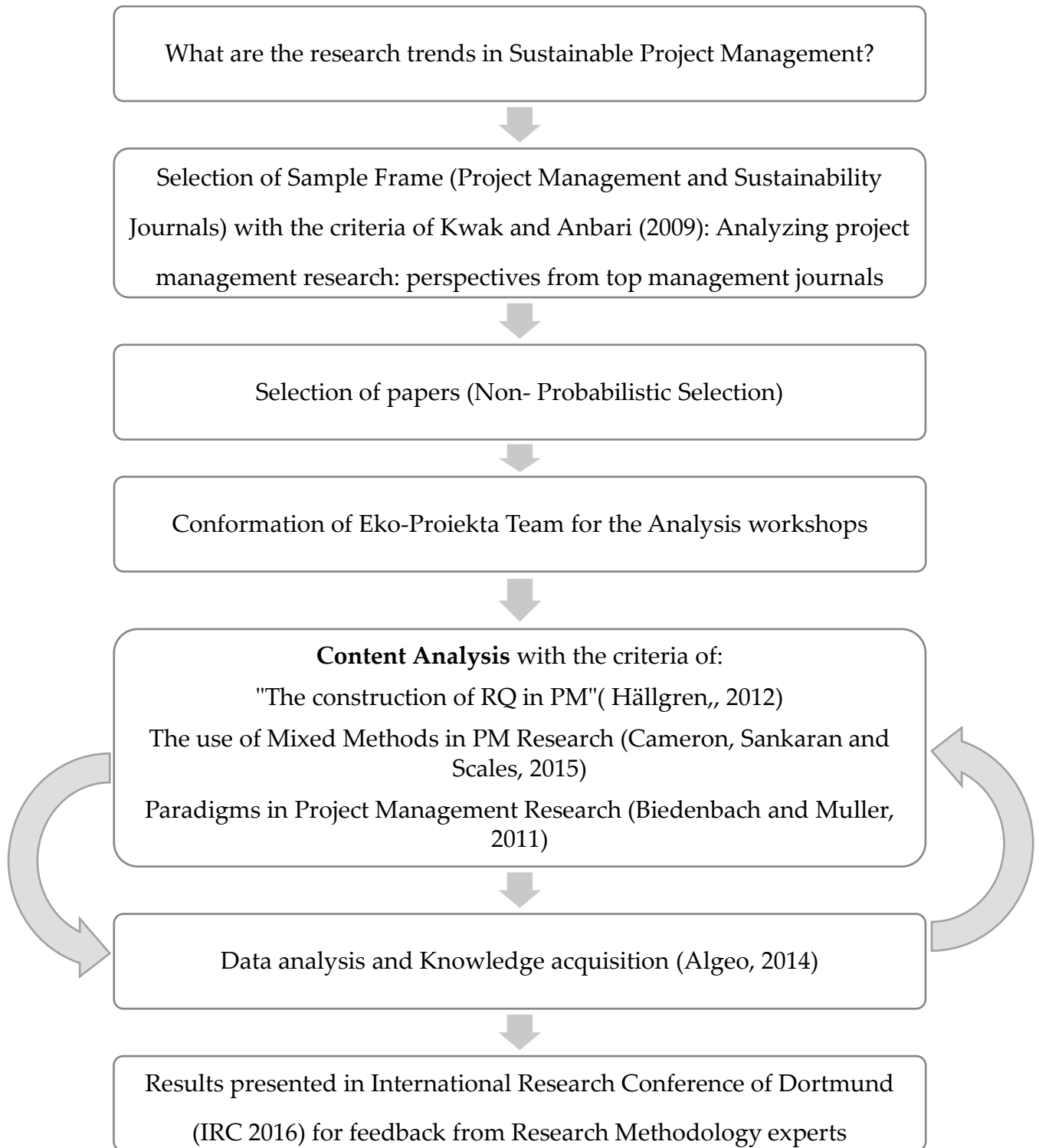


Thesis Navigation Map 5. Study of options: Paradigms in Sustainable Project Management Research

Sustainable Project Management is an emerging topic (Pasian & Silvius, 2016) and the amount of publications, shared meanings and leaders in the field are factors that must be taken into account to consider that Sustainability in Project Management might be a new school of thought (Silvius, 2017).

Before establishing the most appropriate methodological proposal for this research, it has been necessary to reflect on how knowledge is being built in Sustainable Project Management. The philosophical positions that the researchers are using, the way in which the research questions are posed and the most commonly used methods are the most important aspects to be reflected upon. Having a baseline of how knowledge is being created in the field helps to select the most appropriate research technique.

The understanding about philosophical paradigms in PM research could be, at the beginning, a little complex. For this reason, it was designed a strategy to study methodologies as it is shown in Figure 30. For the first step, the selection of sample frame, the approach of Kwak and Anbari (2009) was considered. They suggest that it is necessary to complement PM Journals with allied journals in order to have a better understanding of the relationship with other fields.



• *Figure 30 Sustainable PM Research: Knowledge acquisition of PM Research trends. Source: Author based on: Algeo (2014), Biedenbach and Muller (2011), Kwak and Anbari (2009)*

The next journals were chosen:

- The four PM Journals: International Journal of Project Management (IJPM), the Journal of Project Management (JPM), International Journal of Managing Projects in Business (JMPB), International Journal of Project Organization and Management (IJPOM)
- Journals in allied areas as defined by Kwak and Anbari (2009) and listed in Table 12.
- Sustainability and environment related journals.

Table 12 is a list of the journals selected to search for papers whose research scope is Sustainable Project Management.

Table 12 Journal for the framework Sustainability and PM Research

Field	Journal Name	ISBN	Quartile within its category
Project management	International Journal of Project Management	0263-7863	Q1
	Project Management Journal	1938-9507	Q3
	International Journal of Managing Projects in Business	1753-8378	
	International Journal of Project Organization and Management	1740-2905	
Allied Management Journals	AOM Journal (AMJ)*	0001-4273	Q1
	Academy of Management Annals	1941-6520	Q1
	AOM Review (AMR)*	0363-7425	Q1
	MIS Quarterly (MISQ)*	2162-9730	Q1
	Information Systems Research (ISR)*	1047-7047	Q1

	IEEE Transactions of Engineering Management (IEEE-TEM)	0018-9391	Q3
	Interfaces (INTFCS)	0092-2102	Q4
Sustainability Journals	TRENDS IN ECOLOGY & EVOLUTION	0169-5347	Q1
	Sustainable Development	9680802	Q2
	Environment and planning government and policy		Q1
	Impact Assessment and Project Appraisal	1461-5517	Q1

For the bibliometric research SCOPUS and Web of Sciences databases were used (Otegi-Olaso et al., (2016) using the following keywords:

1. "Project management" + methodology
2. "Project management" + sustain*
3. "Project management" OR projects + sustain*
4. "Project management" + environ*
5. "Project management" OR projects + environ*

The output of "Project management + methodology" was a set of 10 papers, out of which 3 methods were selected after reading the abstract and introduction. The first method is the one used by Biedenbach and Muller (2011) published in the International Journal of managing Projects in Business (IJMPB). In their paper "Paradigms in Project Management Research", they analyse the contents of the papers presented in the International Research Network of Organization by Projects (IRNOP). The purpose was to identify the more frequent philosophical stances and related methodologies adopted by researchers. The criteria for the analysis is shown in Box 5.

Box 5. Approaches to analyse papers of Project Management. Source: Biedenbach and Muller (2011)

- (1) Ontological position (Saunders et al., 2009): objectivism, pragmatism and subjectivism
- (2) Epistemological position (Bryman, 2007; Saunders et al., 2009) : positivism, post-positivism, realism, pragmatism and interpretivism.
- (3) Methodology: conceptual papers, surveys, case studies, mixed methods, action research, etc
- (4) Method: mixed, quantitative, qualitative, etc

Biedenbach and Muller (2011) concluded that the prevailing philosophical stances of the IRNOP conferences were subjectivism as ontology, interpretivism as epistemology, case studies as methodology and qualitative methods. These results differ from those of Smyth and Morris (2007) who found that most articles published in the IJPM have a positivist approach. The explanation could be that the papers in the conferences are in the stage of developing theories and need more feedback from their peers to mature the proposals.

The second method is the one used by Hällgren (2012): “The construction of Research Question on PM” published by the International Journal of Project Management (IJPM). In this analysis, 61 project management research papers were studied. Hällgren,

(2012) analysed the construction of the research question according to the approach of Sandberg and Alvesson (2011) and found that PM research is more oriented to gap spotting than to problematization. Gap spotting reaffirms or neglect the existence of previous theories but the lack of problematization doesn't allow to innovate the theory.

The third method is the one used by Cameron, Sankaran and Scales (2015) published by the Journal of Project Management (JPM). They analysed the papers according to the criteria of Tashakkori and Teddlie (2010). The objective is to determine the prevalence, quality and reporting of mixed methods in Project Management Research. Their results suggest that the papers do not explicit acknowledge the use of mixed methods, and in the conclusion they recommend that more papers are needed with this methodology in order to enrich the field with other areas where these methods are more frequent.

Biedenbach and Muller (2011), Hällgren (2012) and Cameron, et al. (2015) analysed papers with the aim of identifying research methodologies trends in Project Management. Based on these three authors, we set out to analyse research methodologies, but in the context of Sustainability and Project Management. The goal of the analysis was twofold. First, to understand what are the methods used to increase the understanding in Sustainable Project Management and second, to select the most appropriate research method for this thesis.

Once all three methods had been chosen, the Project Management Doctoral Programme in the University of the Basque Country organized a collective learning strategy to replicate the work Biedenbach and Muller (2011), Hällgren (2012) and Cameron, et al. (2015) . The learning group consisted of 4 members: 2 doctoral students and 2 master's students. Collaborative learning is based on the method proposed by Algeo (2014) and Piggot-Irvine (2009): Action Research . It consists of an iterative process of action, planning and group reflection (Figure 31). In each reflection session the members of the group interchanged their understanding about research methodologies in Sustainable Project Management (Fuentes-Ardeo, Otegi-Olaso, & Aguilar-Fernandez, 2016).

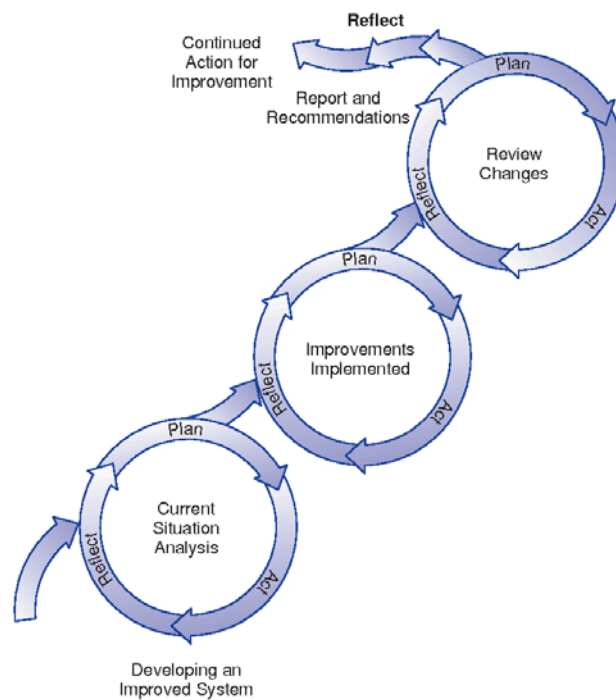


Figure 31 Action Research Model. Source: Algeo (2014) and Piggot-Irvine (2009)

In the first reflection session, the group received a set of 20 documents (Appendix A). The papers were selected from the framework of Table 12. Each member received instructions on how to critically read them.

In the second workshop, every participant received a set of questions based on Hällgren, (2012), Cameron, Sankaran and Scales (2015) and Biedenbach and Muller (2011). The answers are meant to be a guide to identify the type of research questions, and methods of each paper (Table 13).

Table 13 Question to critically read papers about Sustainability and Project Management. Source: Author

What are the Research questions? Are they explicit or implicit?

Do they try to solve problems from the past or do they anticipate the future?

Are they looking for coherence or incoherence in the Literature Review?

Does the author look for deficiencies in current theory (literature review)?

Do they talk about contradictions in the Literature Review?

Does the author identify areas that need to be investigated?

Does the author acknowledge in the LT that the area is well researched?

Does the author acknowledge that much research is needed in the area?

Does the author assert that there is already a theory but that it needs to be empirically proven?

What is the empirical application of the paper?

Does the author deny the concepts of Literature Review?

Does the author identify problems or inconsistencies in the LR?

Is he looking for a critical confrontation with the authors of the LR? Does he propose new ideas?

Is the paper aimed at practitioners?

Does it produce a theory?

What implications does it propose after research?

What creative solutions does it propose?

Data collection: qualitative, quantitative or both?

Data collection: are both, qualitative and quantitative data collected at the same time?

Data collection: is any form of data collection building on the other (sequential)?

Data collection: is any of the methods being emphasized? What method?

Data Analysis: qualitative, quantitative or both?

Describe briefly the sequence of the methodology used? Is any method dominant?

Do the authors mention / declare that they are using mixed methods (it can also be named as combined method, integrated method, multilevel...)?

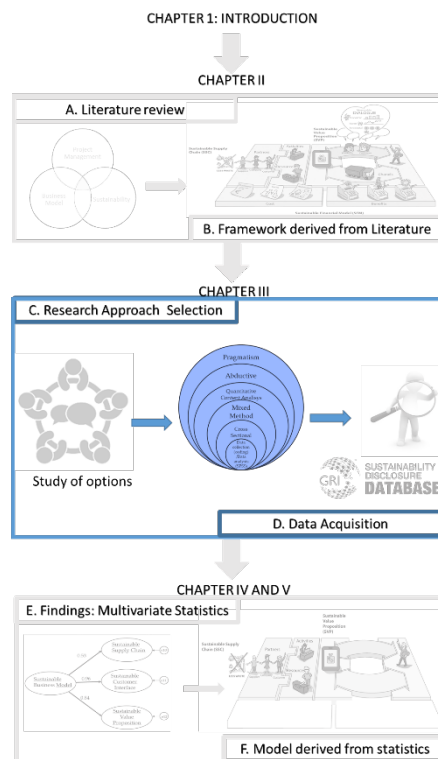
In the third workshop, obtained knowledge was exchanged and discussed. Finally, the results of the process (Table 14) were presented in the International Research Conference of Dortmund (IRC 2016). In this conference, the group received external feedback from researchers with experience in the field of Project Management.

Table 14 Sustainable Project Management Research: Findings presented in the International Research Conference, Dortmund, 2016. Source: Aguilar-Fernández, Otegi-Olaso, & Fuentes-Ardeo (2016b), Briongos-Vázquez, Otegi-Olaso, & Martínez-León (2016), Martínez-León, Otegi-Olaso, & Briongos-Vázquez (2016)

Mixed Methods Use In Sustainable Project Management Research	“Mixed methods use in the field of sustainable project management is gaining momentum.
The Construction of Research Questions in Sustainable Project Management	The majority of the researchers do not explicitly report the use of mixed methods”(Martínez-León et al., 2016)
Philosophical paradigms in	Most of the papers are constructed according to research overview and gap spotting approaches. Research overview mode checks the literature looking for a guideline to understand past and/or future research evolutions. Gap spotting tries to identify a gap in the literature, an area which requires academic attention and analysis. These 2 predominant modes match the needs of a new field like sustainable project management is, which needs to develop new theories.(Briongos-Vázquez et al., 2016)
	The results show a dominance of ontological subjectivism, epistemological interpretivism, the creation of theories through multiple case studies and the increasing use of mixed

Sustainable Project Management Research method. At the same time, most of the authors are still reluctant to describe explicitly their philosophical stances and just apply the methods without an analysis of the alternatives they have to approach the object of study (Aguilar-Fernandez et al., 2016b).

2. The Research Philosophy



Thesis Navigation Map 6. The Research Philosophy adopted in this Thesis

The paradigm adopted in this research is pragmatism (Biedenbach & Müller, 2011). This philosophical posture accepts the use or mixture of various epistemological,

ontological, and axiological postures (Saunders, Lewis, & Thornhill, 2009). In Figure 32 it is shown the methodology approach of this research.

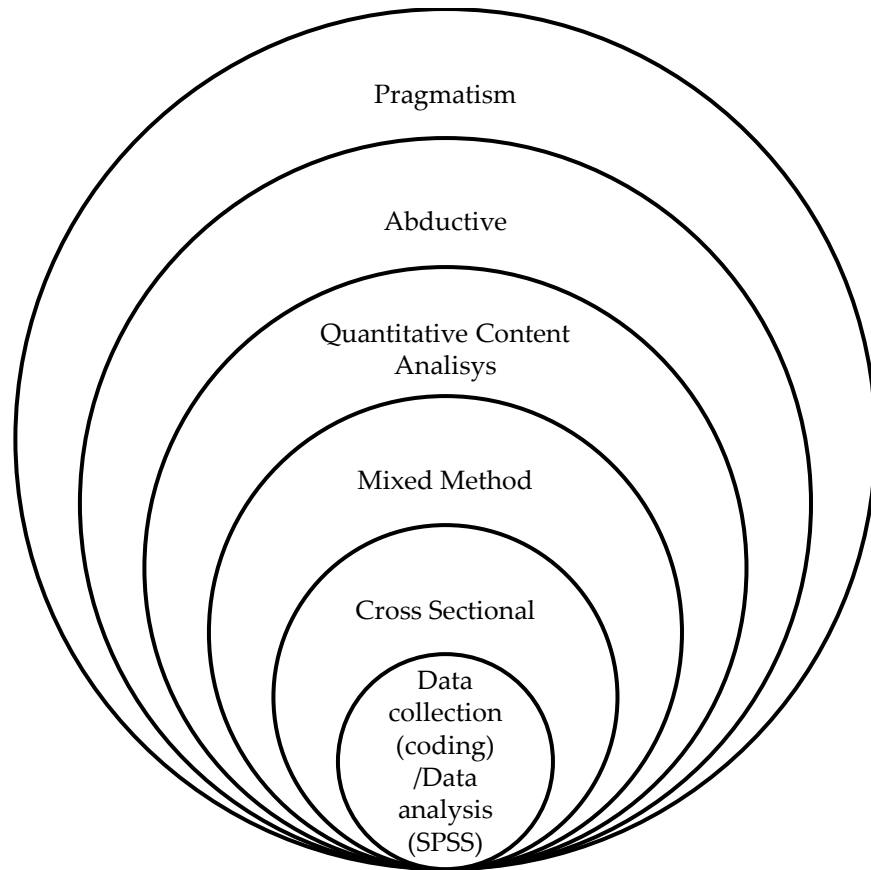


Figure 32 Methodology approach (Source: The author, adapted from Saunder's Onion)

The question guiding this study is:

RQ: How are sustainable concepts reflected in the projects carried out by socially responsible companies?

According to Hällgren, (2012), this type of question would belong to a gap spotting type because it looks for areas where there is not sufficient theory: The integration of Sustainability in Project Management.

Two steps are necessary to answer this question. In the first step it is necessary to identify companies committed to sustainability. In the second step it is necessary to analyse the projects executed by these sustainable companies.

We may consider that the organizations committed to sustainability are those that implement clean production, that are concerned with corporate social responsibility strategies or that implement the triple bottom accounting (Elkington, John, 1998a) with the consequent disclosure to society through sustainable reports.

Elkington (1994) states that sustainable enterprises have typically moved through several stages: ignorance, awakening, denial, reduction of guilt, conversion and integration. The leading companies have managed to implement initiatives that contribute to the three dimensions of sustainability, keep an accounting of these actions with indicators and also communicate it to their stakeholders and investors through sustainable reports (Eccles, Robert G. & Krzus, 2014).

For this research, companies that are part of the Global Reporting Initiative (GRI) network have been chosen. Participating in the Global Reporting Initiative is an indicator of them being sustainability aware companies. GRI network provides a framework to

which organizations can subscribe to publish their sustainable activities. They do it in an Integrative Report <IR> with economic, social and environmental indicators. Currently GRI is the most widely used standard (Del Mar Alonso-Almeida, Llach, & Marimon, 2014; Legendre, Stéphane & Coderre, 2013; Toppinen, Li, Tuppuru, & Xiong, 2012; Tsang, Welford, & Brown, 2009).

The companies affiliated to the GRI publicize their main projects in the Integrated Reports (Tiron-Tudor & Dragu, 2013). Although the level of credibility of these reports may be questionable, it is a source of explicit information on sustainability that can lead to inferences thanks to a rigorous content analysis (Lock & Seele, 2016; Neuendorf, 2016).

According to Krippendorff (2004), when inferences start from a specific text group towards the answer to a specific researcher's question, we are talking about an abductive approach to develop theory. Then, the abductive inference is guaranteed by the application of an analytical construct. This analytical construct is applied to the content of the texts to answer the research question.

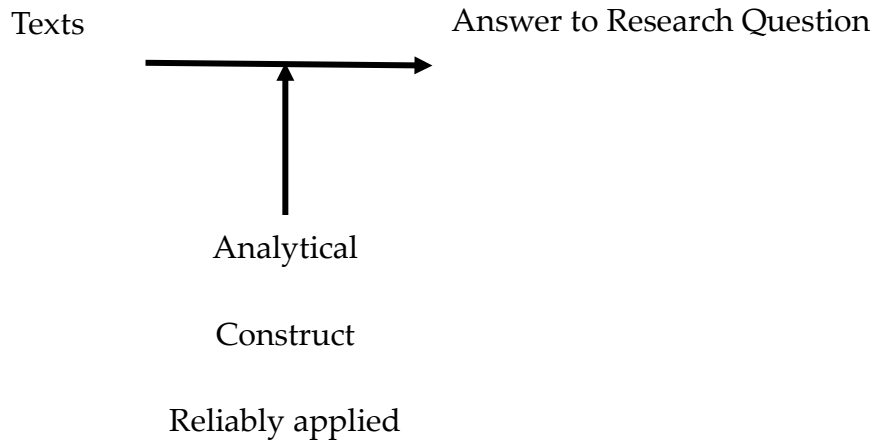


Figure 2 Abductive inferences (Krippendorff, 2004) (p38)

In our case, the elements of the abductive inference model are:

Text: GRI reports.

RQ: How are sustainable concepts reflected in the projects carried out by socially responsible companies?

Analytical construct derived from the review of the literature: The business model for sustainable innovation.

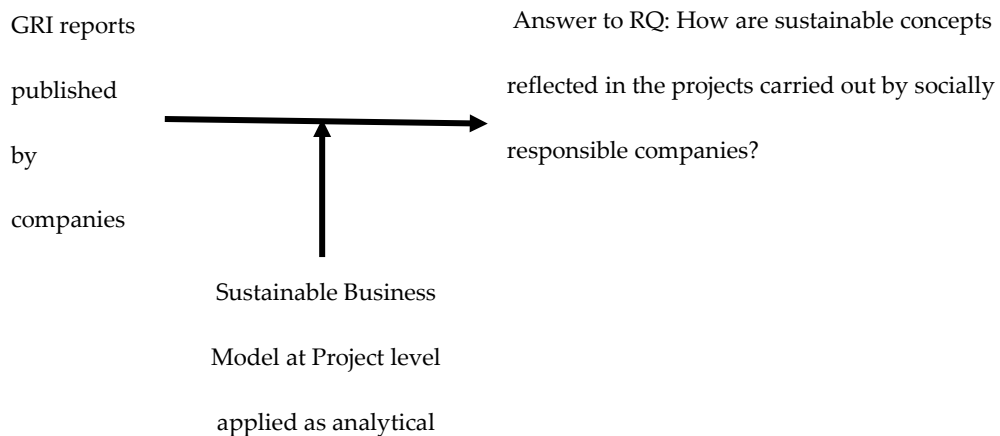


Figure 3 Abductive inference of this research. Source: The author, adapted from Krippendorff (2004)

3. Quantitative Content Analysis

Analysis of content related to Sustainability and Project Management has been already used in Project Management research. Some examples are the analysis of Project Management Standards in (Eskerod, P. & Huemann, 2013; Silvius, 2012c) and the analysis of the projects published in GRI reports in (Tiron-Tudor & Dragu, 2013).

Eskerod and Huemann (2013) concluded that PMBok lacks of sustainable development considerations. Silvius (2012c) propose how it would be possible to integrate sustainable development principles in Project Management standards. On the other hand, Tiron-Tudor and Dragu (2013) wanted to find relationships between the integration of sustainability in projects and the project success and did it by analysing corporate reports (GRI). The findings concluded that sustainable practice did not necessary lead to success

Bos-Brouwers (2010) argued that corporate reports of the Global Reporting Initiative (GRI) are a source of information that reflects the issues that companies are interested in communicating and implementing about socio-environmental concerns

The Integrated Reporting <IR> framework established by the Global Reporting Initiative (GRI G4) was chosen since it reflects the sustainable value creation process of a company. According to The International Integrated Reporting Council (2013) the GRI

G4 report should answer the core question: What is the organization's business model?

We found GRI G4 Integrated Report Framework as the most suitable because:

- it reports for the 'triple bottom line' with index in the economic, social, and environmental issues
- It has already been used by Project Management practitioners (Carboni, Gonzalez, & Hodgkinson, 2013)
- It has already been used in the 2010 IPMA Expert Seminar (Silvius, 2012)
- It allows comparability between firms (Alonso-Almeida, Llach, & Marimon, 2014)
- It contains information for different types of stakeholders (Schadewitz & Niskala, 2010)
- It has become the most widely accepted guideline (Alonso-Almeida et al., 2014; Legendre, S. & Coderre, 2013; Toppinen et al., 2012; Tsang et al., 2009).

Gray Kouhy and Lavers (1995) were the firsts to create a database based on corporate reports for research purposes. This method has been used in research on accounting, communication, and sustainability.

There are important efforts to motivate companies to adopt the IR framework of GRI to show their efforts towards sustainability (Eccles, Robert G. & Krzus, 2014). However, these reports are not without debate. Studies such as that of Lock and Seele (2016) have employed the content analysis method to assess the credibility of reports. The

results of their study suggest that lack of understanding and standardization do have an effect on credibility.

In order to analyse the projects disclosed in GRI companies, we have used quantitative content analysis (Krippendorff, 2004; Mayring, 2014; Neuendorf, 2016) as a method. Krippendorff (2004) defines this method as a replicable and valid technique for making inferences from the text to the context of their use. It provides new insights and increases an understanding of a phenomena. A replicable content analysis must be compounded by six components as suggested in box 5:

Box 5. Components of Content Analysis (Krippendorff, 2004)

- (5)Unitizing: relying on unitizing schemes
- (6)Sampling: relying on sampling plans
- (7) Recording/coding: relying on coding instructions
- (8)Reducing data to manageable representations: relying on established statistical techniques or other methods for summarizing or simplifying data
- (9)Abductively inferring contextual phenomena: relying on analytical constructs or models of the chosen context as warrants
- (10)Narrating the answer to the research question: relying on narrative traditions or discursive conventions established within the discipline of the content analyst

Neuendorf (2016) stated that content analysis is a summarizing, quantitative analysis of messages that relies on the scientific method (including attention to objectivity-intersubjectivity, a priori design, reliability, validity, generalizability, replicability and hypothesis testing) and is not limited as to the types of variables that may be measured or the context in which the messages are created or presented. According to Neuendorf (2016), a scientific content analysis must follow a process of 7 steps as detailed in Box 6:

Box 6. Process of Content Analysis (Neuendorf, 2016)

- (11) Theory and rationale
- (12) Conceptualizations
- (13) Operationalizations
- (14) Coding schemes (coding book, coding form)
- (15) Sampling
- (16) Coding
- (17) Tabulation and reporting.

Mayring (2014) defined Content Analysis as a Mixed Method because it uses qualitative and quantitative steps to acquire data and interpret results. According to the

notation of Cameron et al. (2015) the type of this research would be BD and the sequence/ dominance qual → QUAN → QUAN → qual (Figure 35).

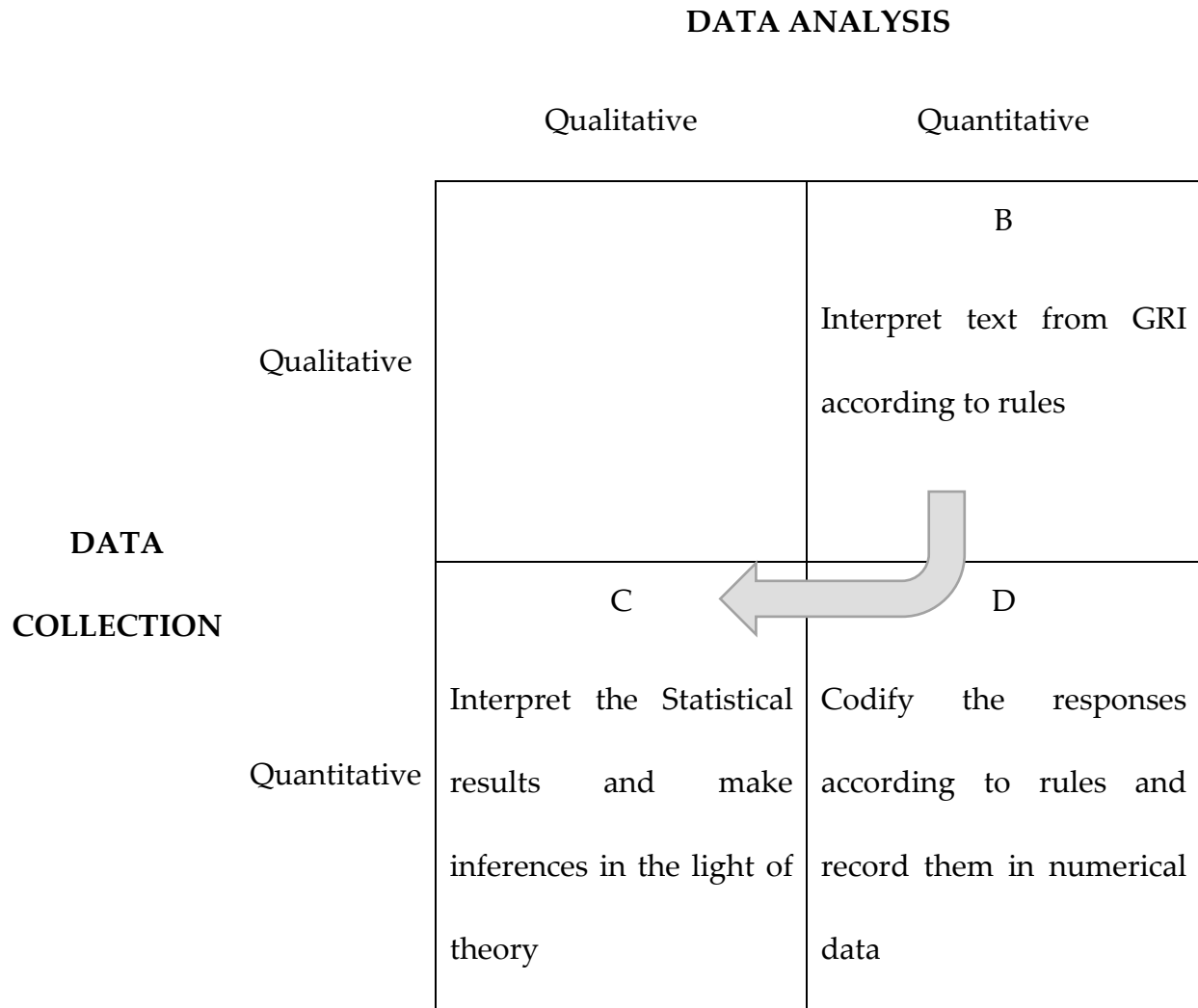


Figure 35 Mixed method approach, adapted from Cameron et al. (2016)

According to Neuendorf (2016) and Krippendorff (2004), the evaluation criteria must be created based on literature. When the criteria are met, data should be coded within variables. After that, the variables should be treated with statistical techniques, appropriate to the purpose of the study.

To examine how projects fit with the notion of sustainable business model, a checklist derived from the literature review has been created (Table 4). The check-list is made up of the requirements that need to be met for a Business Model for Sustainable Innovation (BMfSI) in order to innovate towards sustainability. The business model is recognized as an analytical tool,(Upward, A. & Jones, 2016) that connects the strategy with the operative level, serves to examine business units that co-exist within the company (Zott & Amit, 2007), and can be applied to assess innovation projects (Reginato, 2009).

In this research, the creation of rules, or analytical construct is derived from the theory. The creation of rules for analysis has a positivist approach. Then, the text analysts (coders) *interpret* the data under the rules and record these data in numbers. Statistical analysis of the database allows inferences to be drawn from the results.





Table 15 Analytical constructs based in the concepts of Boons and Ludeke-Freund (2013)

Variable	Assessment	Value
Measurable Value	The value proposition does not provide users with a measurable ecological and/or social value in concert with economic value	0
	The value proposition provides users with a measurable ecological and/or social value in concert with economic value	1
Balance	A particular balance is not embedded in the design, production, and consumption processes.	0
	A particular balance is embedded in the design, production, and consumption processes.	1

Social Dialogue	The business model does not reflect a dialogue with the stakeholders concerning the balance of economic, ecological, and social needs. Or such values are not temporally and spatially determined.	0
	The business model reflects a dialogue with the stakeholders concerning the balance of economic, ecological, and social needs, and such values are temporally and spatially determined.	1
Key Partners	The business model does not involve suppliers who take responsibility for their own as well as for the focal company's stakeholder	0
	The business model involves suppliers who take responsibility for their own as well as for the focal company's stakeholder	1
Shift of socio-ecological burdens to its suppliers	The company shifts its own socio-ecological burdens to its suppliers	0
	The company does not shift its own socio-ecological burdens to its suppliers	1
Motivation of Consumer for their responsible consumption	The company does not motivate users to take responsibility for their consumption	0
	The company motivates users to take responsibility for their consumption	1
Shift of their own socio-ecological burden to its customer	The company shifts its own socio-ecological burden to its customer	0
	The company does not shift its own socio-ecological burden to its customer	1
Customer Relationship	Customer relationships are not set up with recognition of the respective sustainability challenges	0
	Customer relationships are set up with recognition of the respective sustainability challenges	1
Distribution of economic costs and benefits	Inappropriate Distribution	0
	Appropriate distribution	1

Accounting for impacts	The company does not account for the ecological and social impacts	0
	The company accounts for the ecological and social impacts	1
Customer Relationship	Are not set up with recognition of the respective sustainability challenges	0
	Are set up with recognition of the respective sustainability challenges	1
Distribution of economic costs and benefits	Inappropriate Distribution	0
	Appropriate distribution	1
Accounting for impacts	Does not account for the ecological and social impacts	0
	Accounts for the ecological and social impacts	1

The elements in the Table 15 can be considered the a priori content categories derived from theory. The requirements of Boons and Ludeke-Freund (2013) has been useful to create 10 analytical categories grouped in four dominions: Sustainable Value Proposition, Sustainable Supply Chain, Sustainable Customer Interface and Sustainable Financial Model as shown in Figure 36.

Sustainable Value Proposition (SVP)			Sustainable Supply chain (SSC)	
MV	SD	B	KP	KS
		Balance		
Measure Value	Social Dialogue		Key Partner	Key Suppliers





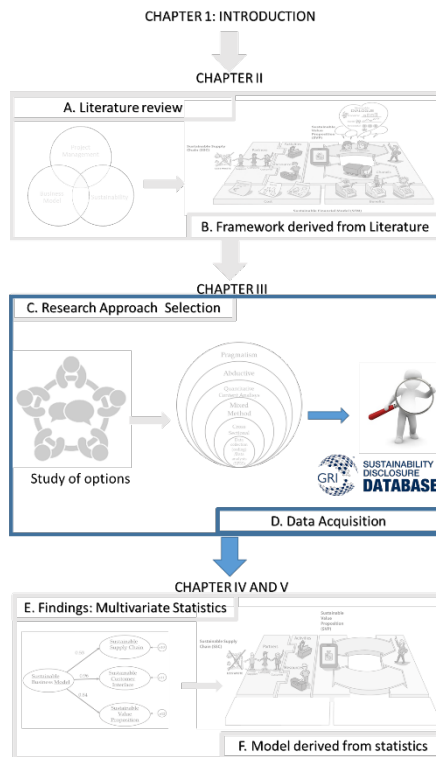
Sustainable Customer Interface (SCI)			Sustainable Financial Model (SFM)	
MC	NS	CR	AD	AI
		Customer Relationships		
Motivates Consumer	No shift socio-ecological burdens		Appropriate Distribution	Account for Impacts

Figure 36 Analytical categories for the Content Analysis

3.1 The sample frame



Thesis Navigation Map 7. The data Acquisition

For selecting the suitable sample frame, several sources were considered. GRI G4 reporting of <IR> framework was chosen since it reflects the value creation process of a company. There are several versions of GRI reports but, the G4 version includes not only combined but integral reporting, considering all the environmental, social and governance issues of the Triple Bottom Line (Elkington, John, 1997). The GRI database is publicly accessible (<http://database.globalreporting.org>) and contains the corporate reports of the companies, classified by year, size, country and region. The suitable sample frame of this paper has been defined as follows:

- Self-declared as an integrated report
- Reported with G4 guidelines
- Published by a company of any size
- Published in 2015 (for the 2014 fiscal year)
- English language
- PDF format
- Complied with the Sustainability Reporting Assessment Checklist of Van Der Ploeg and Vanclay (2013).

The GRI reports were obtained in October 2015, on one occasion. This decision had to be made as information changes constantly over time (Creswell, 2013; Perecman & Curran, 2006).

3.2 The elements within the sample frame

The goal of the content analysis method was to identify projects within the GRI reports. The projects should show the following characteristics:

- Project as a temporary organization
- The project defines clear deliverables
- The project uses company resources
- The project creates both sustainable and non-sustainable value for the company

Considering these criteria, 186 projects of 67 companies were identified. The number of projects was regarded as the total population and all of these were statistically analysed. The projects were varied in nature. Some companies undertook product or service innovations, others improved their supply chain, whilst some companies undertook projects only to enhance their image within the community or to implement environmental monitoring systems.

3.3 The data units

The use of a structured data collection method is necessary for coding, analysing and interpreting information in an orderly manner. In content analysis, the phenomenon under observation is communication. It is the content manifested in a message. By

collecting data through content analysis, trained researchers do not control the phenomena being studied, but simply record what they read.

The procedure is structured since both the content to be observed and the way to record it are specified in detail. This reduces the potential bias of the researcher and increases the level of confidence in the data.

The object to analyse is the project, and the measurable elements are the categories of the Sustainable Business Model (Figure 36). The units of analysis are words, themes, characters and measurements of space and time.

3.4 The measure and scale

Thanks to the check-list derived from the theoretical framework (Table 15), the projects could be graded. In total, 186 were found and analysed. The analysis and coding of projects was carried out by 4 people with academic and professional training in Project Management. The projects were analysed from January to March 2016. In order to calibrate the responses and reach consensus on the criteria, 6 calibration meetings were held.

The codebook shown in Table 16 , is derived from the literature review and was created to collect the data:

Table 16 Codebook to analyse projects through the lens of sustainable business model. Source: The author

Variable Code	Name of the Variable	Explicit characteristics of the Sustainable Project Business Model	Explicit Value?	Type of code
MV	Measurable value	The value proposition provides to the project users a measurable ecological and/or social value in concert with economic value.	Y = 1 No = 0	Numeric
SD	Social dialogue	There is a project-stakeholders dialogue concerning the balance of economic, ecological, and social needs, and such values are temporally and spatially determined	Y = 1 No = 0	Numeric
B	Balance	For project deliverables and outputs, a particular balance is embedded in the design, production, and consumption processes. Such a balance is actively being struck among stakeholders	Y = 1 No = 0	Numeric
KP	Key Partners	Involves suppliers who take responsibility for their own as well as for the focal company's stakeholder.	Y = 1 No = 0	Numeric
KS	No shift to suppliers	The company does not shift its own socio-ecological burdens to its suppliers	Y = 1 No = 0	Numeric

KA	Key Activities	Sustainable Innovation is a key activity of the project. It includes forms of social issue management and material recycling to avoid and reuse waste.	Y = 1 No = 0	Numeric
MC	Motivates project users	Motivates project user to take responsibility for their consumption as well as for the focal company's stakeholders. The sustainable output of the project adds a competitive advantage to the company.	Y = 1 No = 0	Numeric
NS	No shift to Project user	The project delivery or project output does not shift their own socio-ecological burden to their customer	Y = 1 No = 0	Numeric
CR	Customer Relationship	Customer relationships are set up with recognition of the respective sustainability challenges of differently developed markets as well as project-specific challenges resulting from its individual project resources management.	Y = 1 No = 0	Numeric
AD	Appropriate Distribution	Appropriate distribution of economic costs and benefits among stakeholders in project output and outcome.	Y = 1 No = 0	Numeric
AI	Account for Impacts	Accounts for the project's ecological and social impacts	Y = 1 No = 0	Numeric

C	Company	Name of the Company	String
OS	Organization Size	Large/Medium/Small	String
OT	Organization type	Private company/ state-owned/ ONG	String
S	Sector	Type of Industry	String
C	Country	Country	String
T	Territory	Territory	String
P	Project	Name of the Project or Description in the GRI report	String

The collected data was scored in an excel spreadsheet (Appendix B), in order to be afterwards analysed with the SPSS tool.

3.5 Illustrative Example

Box 5 illustrates the analysis of a project reported by the Royal BAM Group (<http://database.globalreporting.org/reports/31213/>). The top of the box is a copy of part of the company's GRI report. The lower part shows the evaluation of the research team. It reflects the assessment of the implementation of the requirements of the Business Model for Sustainable Innovation (BMfSI).

Box 5. Assessment of the Low Energy Asphalt Innovation Project guided by the Requirements of Business Model for Sustainable Innovation (BMfSI).

Extracted from the GRI Memory of the Company Royal BAM Group

In general BAM emits greenhouse gasses through the nature of its business. Production of asphalt is one of BAM's carbon intensive activities. BAM can further improve the emissions from its asphalt plants by producing more low energy asphalt (LEAB), which currently awaits wider market acceptance, particularly from governmental clients.

LEAB stands for low energy asphalt concrete. Using LEAB, BAM offers an innovative technology that contributes positively to the natural and living environment. LEAB is sustainable asphalt that lasts as long as conventional asphalt concrete and is just as resistant to road damage, but results in a cleaner living environment. The LEAB-mixture is made at a lower temperature (100 instead of 160 degrees centigrade), resulting in 30–40% energy saving and 30% reduction of CO₂ emissions. In addition, the mixture consists of 60% recycled asphalt that is, in turn, fully recyclable. Up to now 250,000 tonnes of LEAB have been applied in more than 150 infrastructure projects, of which 118,000 tonnes were used in 2014.

In order to investigate the potential of this new type of asphalt to create value for society, BAM commissioned a True Price study. The study indicated that placing LEAB instead of conventional Stone Mastic (Matrix) Asphalt (STAB)

creates an estimated €257,000 less negative impact on the environment per kilometre of highway. This equals the monetised environmental externalities (often referred to as 'environmental cost') of energy use of about 120 Dutch households per year. To calculate the True Price, the main environmental impacts of asphalt production were measured and translated into societal costs. The results show that the production, use, and end-of-life treatment of LEAB asphalt is associated with 30 per cent lower environmental costs than conventional asphalt. Coincidentally, this equals the reduction in energy and CO2 reduction, but is composed of other factors. This makes LEAB an undeniable proposition amongst other government procurers, since it has the same quality, an equal or lower market price, and a better environmental performance than conventional asphalt.

The study provided BAM with insight into the size of environmental impacts occurring in the asphalt production chain, and made those impacts comparable (...) Energy use, material use, and ecotoxicity are the largest remaining environmental externalities for LEAB. True Price methods support better decision making. The results help BAM to steer future innovations and prove that sustainable innovations, such as LEAB, can create value for society without causing additional financial costs.

.....

On 6 March 2014, BAM and six other parties in the construction supply chain, signed a letter of intent with the municipality of Amsterdam to make supply chains more sustainable. The parties will cooperate on closing the raw material loops in demolition, refurbishment and new construction projects. This initiative fits in with the efforts of the municipality and BAM to create a 'circular economy' in which they minimize consumption of raw materials and energy...BAM uses a tool to measure supplier performance. During project preparation, implementation and follow-up, the tool assesses suppliers against the themes safety, quality, total cost, logistics and engineering and process. Operating companies have the opportunity to add any specific criteria. On a scale of 1 to 4, each supplier has to score at least 3 for each criterion. In 2014 a total of 5372 supplier performance assessments were carried out.

In 2014 BAM approached approximately 1600 of its largest suppliers in the Netherlands to request and assist them to calculate their emissions and propose reduction measures...By means of a survey amongst its A-list suppliers, BAM attempted to measure its impact on suppliers' performance on relevant themes. For example, suppliers were asked to what extent their work with and for BAM has led to increased safety or decreased energy usage. BAM will use the results to highlight its value creation process with its supply chain.

Evaluation of the Components of the Business Model for Sustainable Innovation.

Measurable Value

The value proposition provides to users a measurable ecological and/or social value in concert with economic value = 1

Balance

A balance between stakeholders is not embedded in the design, production, and consumption. = 0

Key Partners

Involves suppliers who take responsibility for their own as well as the focal company's stakeholder = 1

Shift socio-ecological burdens to its suppliers

The company does not shift its own socio-ecological burdens to its suppliers = 1

Motivates Consumer for their consumption

Does not motivate user to take responsibility for their consumption as well as for the focal company's stakeholders = 0

Shifts their own socio-ecological burden to its customer:

Does not shift their own socio-ecological burden to its customer = 1

Customer Relationship:

Are not set up with recognition of the respective sustainability challenges = 0

Distribution of economic costs and benefits:

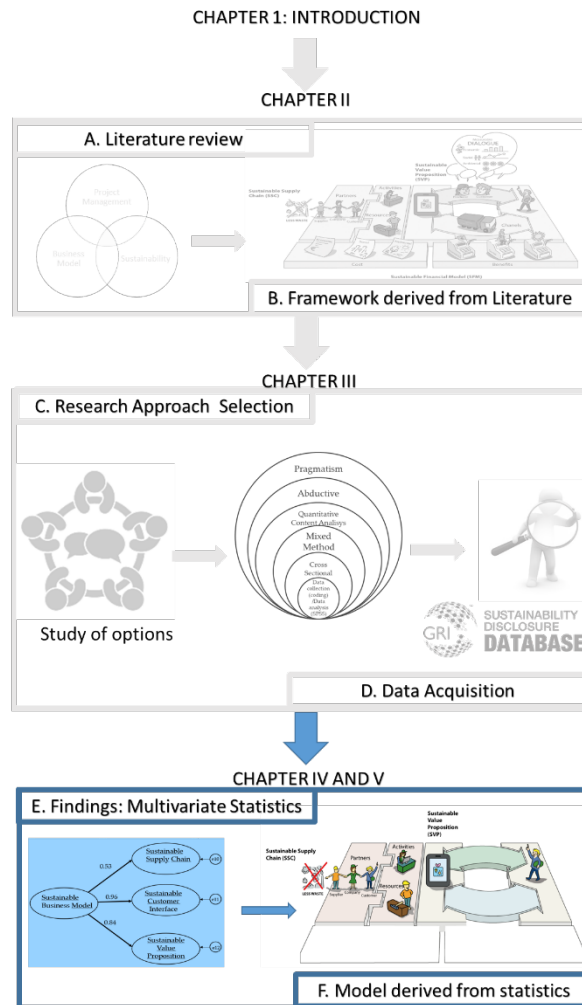
Inappropriate Distribution of economic cost and benefits = 0

Accounting for impacts:

Accounts for the ecological and social impacts = 1

Taking into consideration the list of statistical techniques proposed by Neuendorf (2016) (p. 170) and the purpose of our study, it was decided to do a factor analysis to find the relationships among the set of variables of the business model.

IV. FINDINGS



Thesis Navigation Map 8. Chapter III: Findings

This chapter explains the statistical treatment given to the database in order to be able to interpret the results. The aim is to identify the relevant characteristics (variables) in the data set and to find relationships between them. It has been decided to use multivariate analysis techniques. Multivariate analysis techniques are one of the options suggested by Krippendorff (2004) and Neuendorf to infer the results.

First, an exploratory factorial analysis is conducted to find emerging factors that might explain the relationships between variables. Second, a confirmatory factorial analysis is conducted to consolidate results and examine, in contrast to theory, which sustainability concepts the data reflect. Third, a second-order confirmatory analysis is performed using structural equations to verify whether the dimensions (concepts) that emerge in the analysis belong to a larger dimension. Finally, the results are discussed and the differences between the theory and the results that emerge from the statistical analysis are explained.

4. Exploratory Factor Analysis

Before performing a factor analysis, it is necessary to identify the correlation between individuals through the Kaiser Meyer Olkin (KMO) test and the Barlett test. Factor analysis can only be done if the relevance is high. As shown in Table 17, the KMO value is 0.748 and the significance of the Barlett test is 0.000, less than 0.01. These values indicate that the data are relevant and it is possible to do a factor analysis.

Table 17 KMO Analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.748
Bartlett's Test of Sphericity	Approx. Chi-Square	314.451

df

45

Sig.

.000

With the obtained data we carried out an Exploratory Factor Analysis (EFA). The objective is to understand the relationships between the variables. Exploratory factor analysis can group variables correlated. This means that the 10 variables collected are summarized in a smaller number of variables.

Table 18 contains the sampling adequacy values for the individual variables. As seen in the diagonal, all values exceed 0.5. This indicates that all the variables can be part of the exploratory factor analysis. However, special attention will be paid to variable V2 Social Dialogue (SD) because it is slightly higher than 0.5.

Table 18 Measures of sampling adequacy.

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
V1 MV Measurable Value	.808 ^a									
V2 SD Social Dialogue	.118	.521 ^a								
V3 B Balance	-.189	.065	.826 ^a							
V4 KP Key Partners	.062	-.101	.050	.716 ^a						
V5 KS No shift to Key Supplier	-.105	.217	-.033	-.412	.667 ^a					

V6 MC Motivate Consumer	-.073	.131	-.037	-.029	.104	.786 ^a				
V7 NS No Shift	-.065	-.004	-.143	-.182	-.061	-.115	.805 ^a			
V8 CR Customer Relationship	-.146	.100	-.139	-.195	.148	-.144	-.211	.744 ^a		
V9 AD Appropriate Distribution	-.060	-.039	-.123	-.143	-.186	-.213	-.089	.060	.818 ^a	
V10 AI Account for impacts	-.175	-.212	-.034	-.140	-.124	-.084	.130	-.104	-.101	.714 ^a

a. Measures of Sampling Adequacy(MSA)

The first extraction with the Principal Component method resulted in 3 potential factors with a cumulative variance of 53.714%. However, the fourth factor has an eigen value of 0.923, very close to 1. Therefore, it was decided to include it for a new analysis. In this case, the cumulative variance is 62.941%. See Table 19

Table 19 Extraction of factors with eigen value >0.9

	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.019	30.193	30.193	3.019	30.193	30.193	1.929	19.290	19.290
2	1.299	12.995	43.188	1.299	12.995	43.188	1.732	17.322	36.612
3	1.053	10.526	53.714	1.053	10.526	53.714	1.480	14.801	51.414
4	.923	9.228	62.941	.923	9.228	62.941	1.153	11.528	62.941
5	.836	8.364	71.305						

6	.782	7.822	79.127
7	.626	6.255	85.382
8	.546	5.455	90.837
9	.516	5.158	95.996
10	.400	4.004	100.000

After the analysis of Principal Components, Varimax Rotation was carried out. The rotation serves to make the results more understandable, in a pattern where each variable is heavily loaded in only one of the factors, and more weakly in the other factors. The rotation converged in 6 iterations. Then loads less than 0.5 were suppressed to facilitate the analysis in Table 20.

Table 20 Rotated component Matrix with Varimax Method

	Rotated Component Matrix ^a			
	Component			
	F1	F2	F3	F4
V5 KS No shift to Key Supplier	.848			
V4 KP Key Partners	.784			
V9 AD Appropriate Distribution	.576			
V7 NS No Shift		.740		
V8 CR Customer Relationship		.728		
V6 MC Motivate Costumer		.569		
V1 MV Measurable Value			.755	
V10 AI Account for impacts			.583	.521
V3 B Balance			.527	
V2 SD Social Dialogue				.868

In relation to the variables grouped in each factor, Hair suggests that 3 are the minimum acceptable. In Table 20, the fourth factor contains two variables only: V10 Account for Impacts (AI) and V2 Social Dialogue (SD). This is not the most desirable because it could cause a low identification of problems when the Confirmatory Factor Analysis is performed (CFA). Worthington and Wittaker also state that a factor with two variables can be retained only if the two variables are highly correlated with each other (for example $r > 0.7$). However, this is not the case, the correlation between V10 and V2 is $r = 0.120$. On the other hand, in Table 18, it was already observed that the sampling adequacy value of the variable V2 is only slightly higher than the acceptable minimum ($MSA > 0.5$). Under these three criteria, only factors F1, F2 and F3 were retained for future analysis. Finally, 10 items were grouped into 3 factors, as shown in Table 21.

Table 21 Business Model Factors at project level

Factors	Variable Code	Explicit characteristics of the Sustainable Project Business Model	Load	% of Variance
F1	KS	No shift its own socio-ecological burdens to its suppliers	.848	
Sustainable Supply Chain	KP	Involves suppliers who take responsibility for their own as well as the focal company's stakeholder.	.784	30.193
	AD	Appropriate distribution of economic costs and benefits among stakeholders in project output and outcome.	.576	
F2	NS	The project delivery or project output does not shift their own socio-ecological burden to its customer	.740	
Sustainable Customer Interface	CR	Customer relationships are set up with recognition of the respective sustainability challenges of differently developed markets as well as project-specific challenges resulting from its individual project resources management.	.728	12.995
	MC	Motivates project user to take responsibility for their consumption as well as for the focal company's stakeholders. The sustainable output of the project adds a competitive advantage to the company.	.569	

F3	MV	The value proposition provides to the	.755	
Sustainable		project users a measurable ecological and/or		
Value		social value in concert with economic value.		
Proposition	AI	Accounts for the project's ecological and	.583	10.526
		social impacts		
	B	For project deliverables and outputs, a	.527	
		particular balance is embedded in the		
		design, production, and consumption. Such		
		a balance is actively being struck among		
		stakeholders		

Table 21 indicates the grouping and description of the variables according to the factors. To assign a name to each factor, the Boons and Lüdeke-Freund criteria were followed, which in turn based their classification on previous studies by Osterwalder and Doganova and Eyquem-Renault.

- Sustainable Supply Chain (SSC), would be the way how projects promote key partners (KP) to cooperate in the investment, planning, and execution process of the project. Selection of Key Suppliers (KS) with sustainability criteria, without shifting the own socio-ecological burdens and Appropriate Distribution (AD) of the benefits.

- Sustainable Customer Interface (SCI), would be the way how projects motivate the engagement of the customers (MC) in the relationships (RC). They must be aware that the project does not shift cost (NS) to the social or environmental stakeholders.

- Sustainable Value Proposition (SVP) would be the way how projects create a Measurable Value (MV) with a balanced (B) management-for-stakeholders. Taking in consideration the Account for Impacts (AI).

Contrary to the requirements of Boons and Lüdeke-Freund (2013), the variables V9 Appropriate Distribution (AD) and V10 Account for Impacts (AI), are not correlated in a fourth factor that can be interpreted as requirements for sustainability in the Financial model. However, they are correlated, separately, with the other two factors. The variable Appropriate Distribution of Benefits is within the Sustainable Supply Chain factor and the variable Account for Impacts is within the Sustainable Value Proposition factor. For this reason, for the confirmatory analysis two models will be proposed:

- The first model M1, consists of three latent variables Sustainable requirements in the Supply Chain (SSC), in the Customer Interface (SCI) and the Value Proposition (SVP). The three latent variables are related to their observed variables, as summarized in Table 21.

The second M2 model is also composed of the three latent variables SSC, SCI and SVP of model 1. However, the observed variables Appropriate Distribution of Benefits (AD) and Accounts for Impacts (AI) were excluded. This is because theoretically these requirements are related to the financial component of the business model.

but are inferred from other variables that are observed. Statistical techniques like CFA are used to understand how these latent variables are determined by observable variables. In this investigation, the observable variables are those created in the database thanks to the quantitative content analysis.

The M1 model collects the results of the EFA (Table 21) and proposes 3 latent variables. The latent variable Sustainable Supply Chain corresponds to Factor F1, the latent variable Sustainable Customer Interface corresponds to Factor F2 and the latent variable Sustainable Value Proposition corresponds to the factor F3.

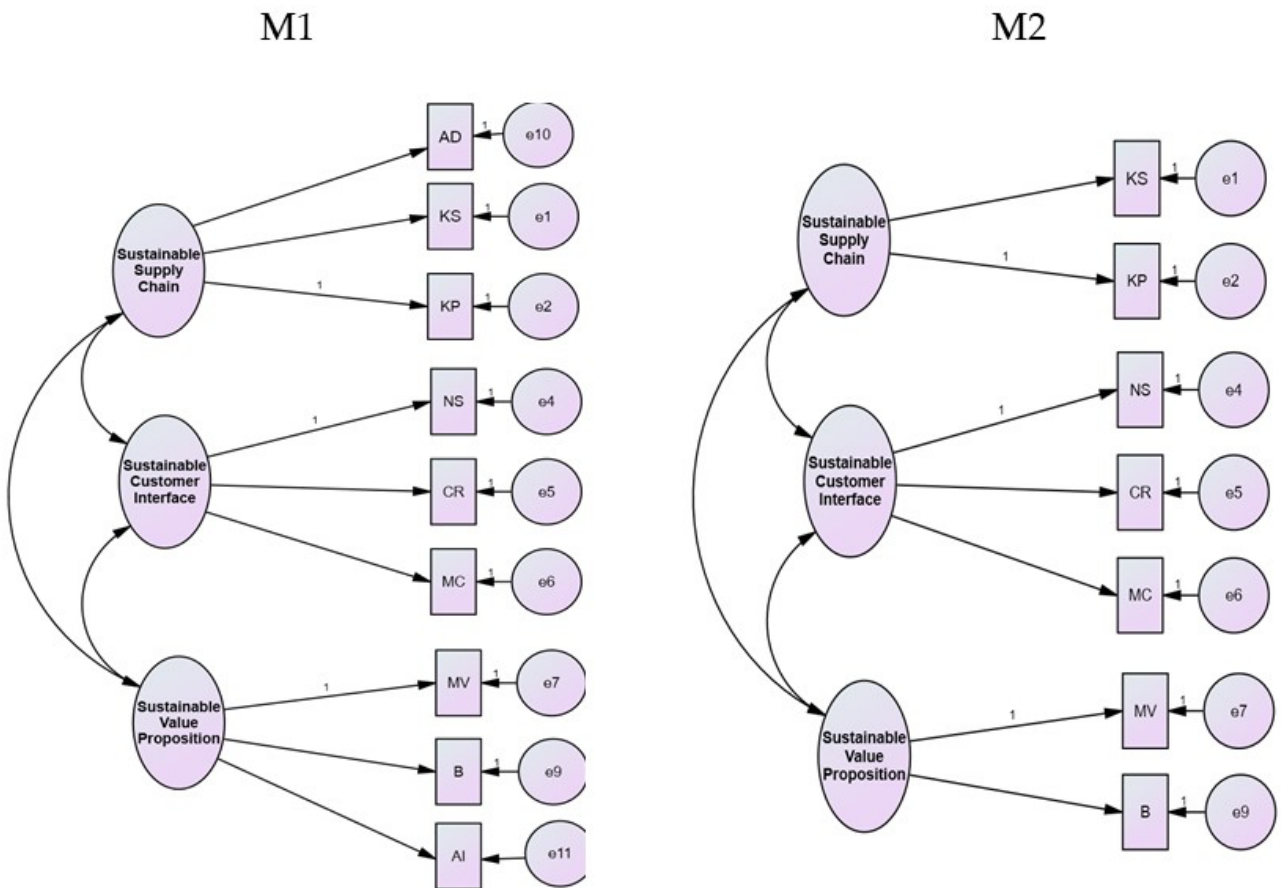


Figure 37 Path diagram for models M1 and M2

The M2 model also collects the results of the EFA (Table 21), however, it discards the variables AD and AI from the model.

The statistic tool AMOS 20 was used to check the fitting degree of the models. The absolute fit index of model M1 is $CMIN/DF = 9.422 > 5$ and the absolute fit index of model M2 is $CMIN/DF = 1.17 < 5$. Therefore, the M1 model is discarded. The other goodness-of-fit indices for the M2 model are shown in Table 22. These indices are within satisfactory ranges; therefore, the model derived from the sequence diagram M2 (Figure 37) can be considered valid to explain the relationships between the dimensions of the analytical construct and their observed variables of the project disclosed in the GRI reports.

Table 22 Selected AMOS Output for CFA Model: Goodness-of-Fit Statistics

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	17	12.871	11	0.302	1.17
Saturated model	28	0	0		
Independence model	7	203.314	21	0	9.682
Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Default model	0.937	0.879	0.99	0.98	0.99
Saturated model	1		1		1
Independence model	0	0	0	0	0
Model	RMSEA	LO 90	HI 90	PCLOSE	
Default model	0.03	0	0.086	0.654	
Independence model	0.217	0.19	0.244	0	

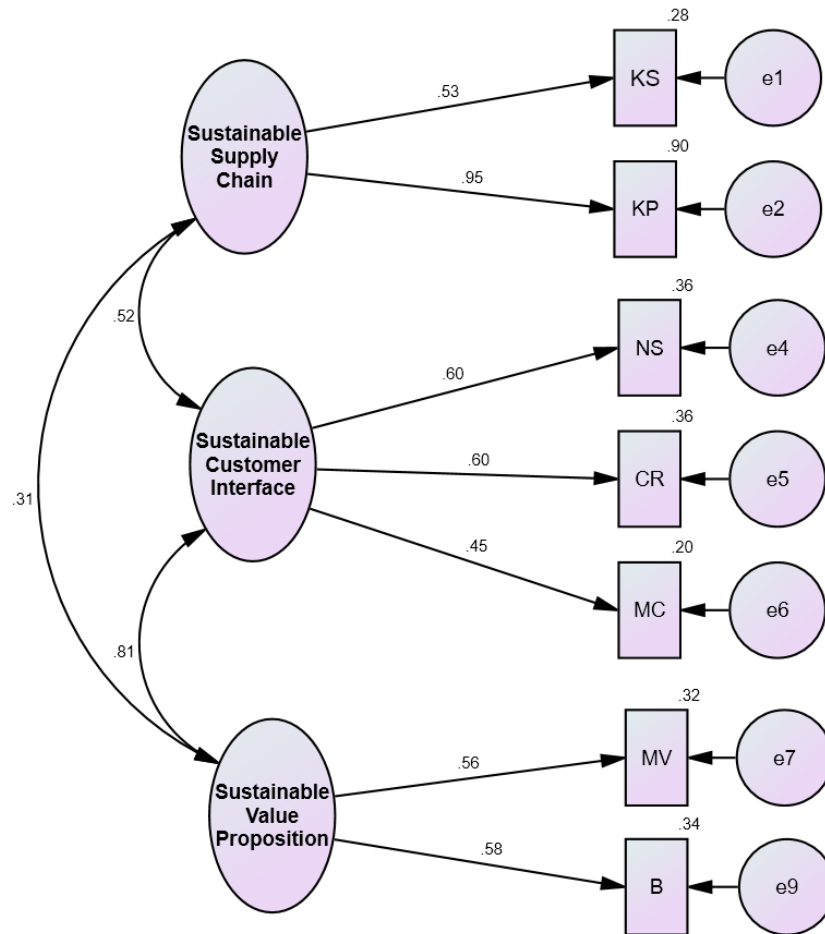


Figure 38 Output path diagram for M2 Model. Confirmatory Factor Analysis to test the validity of the analytical construct
(Theoretical Framework of Table 9)

Regarding the reliability of the model, Hair (2004) points out that for a construct with latent variables and in structural equations in general, it is appropriate to calculate the composite reliability of each latent variable instead of Cronbach's alpha (α). Fornell and Larcker indicate that composite reliability levels below 0.5 are questionable. For our

constructs, the reliabilities are $FC_{\text{sustainable customer interface}} = 0.693$, $FC_{\text{sustainable value proposition}} = 0.663$, $FC_{\text{sustainable supply chain}} = 0.896$. All values are > 0.5 , so the model is reliable.

The discriminant validity tests whether latent variable that are not supposed to be related are actually unrelated. It has been evaluated through the confidence interval of correlations between the factors. Anderson and Gerbin, state that this interval should not include the number "1". All confidence intervals of the model comply with this criterion $\Gamma_{\text{VP-SC}} = (0.280, 0.334)$, $\Gamma_{\text{CI-SC}} = (0.788, 0.835)$, $\Gamma_{\text{VP-CI}} = (0.493, 0.547)$, so we can affirm that they have discriminant validity.

6. Second-order CFA model

The first order CFA model (Figure 38) shows that the three constructs, although correlated, are isolated constructs. To check if the three constructs are actually sub-dimensions of a larger construct, it is necessary to specify a second-order CFA model. If we refer to the review of the literature, Supply Chain, Value Proposition and Customer Interface are dimensions of a broader construct, the business model. The sequence diagram and the estimated model associated with the literature are presented in Figure 39 and Figure 40.

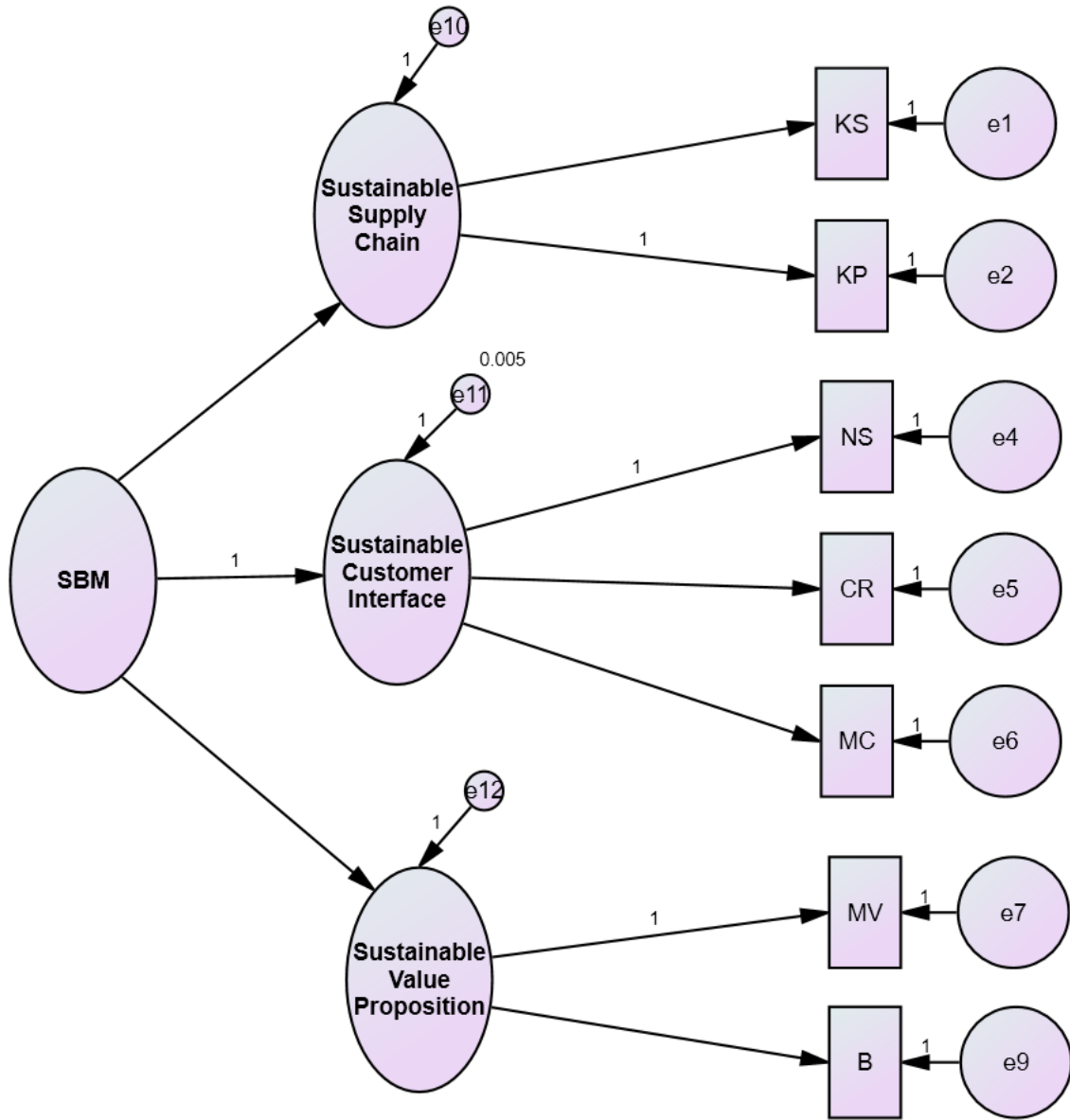


Figure 39 Path diagram for Sustainable Business Model at project level and their sub-dimensions

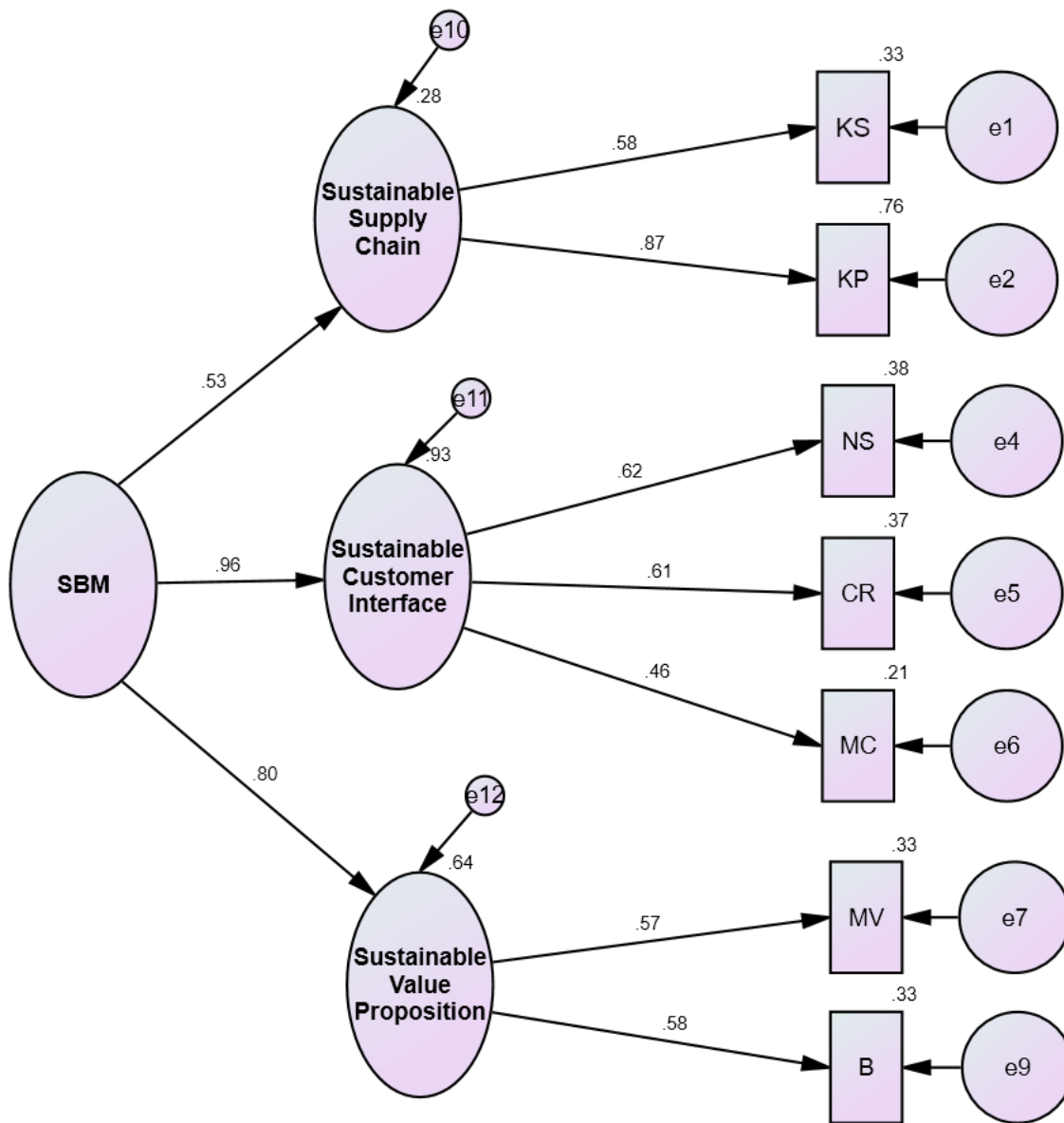


Figure 40 Output path diagram for Sustainable Business Model (SBM) at project level and sub-dimensions

The CMIN/CF for the SBM model is $1.12 < 5$. Therefore, the SBM model is acceptable. The other goodness-of-fit indices for the SBM model are shown in Table 23.

These indices are within satisfactory ranges, therefore, the model derived from the path

diagram (Figure 39) can be considered valid to explain the relationships between the dimensions of the Sustainable Business Model, the sub-dimensions and the observed variables of the projects disclosed in the GRI reports.

Table 23 Selected AMOS Output for SBM Model: Goodness-of-Fit Statistics

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	16	14.355	12	0.279	1.1196
Saturated model	28	0	0		
Independence model	7	203.314	21	0	9.682
Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Default model	0.929	0.876	0.988	0.977	0.987
Saturated model	1		1		1
Independence model	0	0	0	0	0
Model	RMSEA	LO 90	HI 90	PCLOSE	
Default model	0.033	0	0.085	0.646	
Independence model	0.217	0.19	0.244	0	

7. Discussion

The question that guides this study is: **RQ: How are sustainable concepts reflected in the projects carried out by socially responsible companies?** To answer this question, a quantitative content analysis of the GRI reports was carried out, using as criteria the concepts of a sustainable business model. The analysis generated a database, to which reduction techniques were applied with multivariate statistics to find relationships among the variables.

After the Exploratory and Confirmatory Factor Analysis, it was can inferred that the sustainable concepts of the projects carried out by GRI companies are reflected in:

- The Supply Chain, whose elements refer to not diverting waste to suppliers, involving suppliers to be co-responsible and co-creators of value. This conclusions confirm similar findings in literature (Turner, 2010; Loosemore, 2016; Keeys, Lynn A. & Huemann, 2017). This last point, co-creation, is especially important because at the project level it is estimated that suppliers are willing to implement strategies aligned with sustainability when they perceive future benefits (Peenstra & Silvius, 2017).
- The Customer Interface, which represents how the company motivates customers or users to be responsible for their consumption. Although all projects have a closing stage, their impact extends over time due to the exploitation stage (Labuschagne, C. & Brent, 2005). It is an aspect that must be considered from the conception and planning of the project, and also to be transmitted to the clients in the execution and control processes. It also includes the mutual recognition of what the challenges are in relation to the sustainability of the management of project resources. This factor also refers to not diverting the socio-environmental cost to the stakeholders.
- The Value Proposition. This factor refers to the fact that, together with the economic benefits, the project delivers its products or services with socio-environmental metrics (Abidin & Pasquire, 2007; Al-Saleh & Taleb, 2010). During the execution

process there is a balance between the different stakeholders, which can be reflected in the co-creation of value and commitment (Keeys, Lynn A. & Huemann, 2017; Mathur et al., 2008). Contrary to theory, the descriptive factor found in this research does not include dialogue with stakeholders. This does not mean that the dialogue is non-existent, it indicates that the dialogue is not sustainability oriented, that is, the socio-environmental aspects are not communicated in a measurable way.

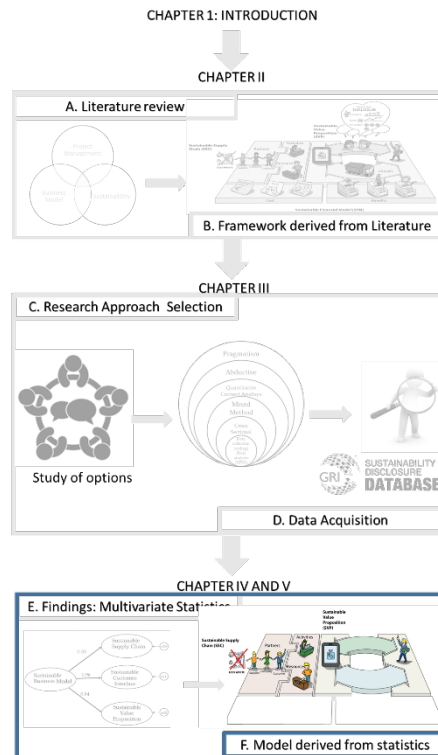
According to the Second-order Confirmatory Factor Analysis and coinciding with the theory, these three factors are not isolated constructs, they belong to a superior construct that we have called Sustainable Business Model. However, it should be noted that our sample does not reflect sustainability in the financial aspects of the projects. That is, the projects do not account for socio-environmental impacts or make an equitable distribution of profits among stakeholders. We could suggest that, in light of the theory, the sustainable business model, at the project level, is incomplete. This result could also have as explanation that currently, there are no common methodologies with indicators to measure progress or socio-environmental cost in projects, such as those that exist to control the earned value. However, in the literature there are already proposals that gain ground in this area. These proposals suggest, among other instruments, the analysis in the environmental and social feasibility study of the projects, before proceeding with the investment (Weninger & Huemann, 2013).

The regression coefficients of the second-order model also provide relevant information (Figure 40). The first is that sustainability in projects is reflected to a greater extent in the Customer Interface ($\lambda=.96$), followed by the value proposition ($\lambda=.80$) and to a lesser extent in the supply chain ($\lambda=.56$). It seems that the greatest efforts are focused on relationship with customers ($\lambda=.61$), on having responsible suppliers ($\lambda=.87$) and delivering a measurable product or service ($\lambda=.57$). However, the projects do not reflect that they are motivating customers ($\lambda=.46$) to exercise responsible use of the products they receive. In the same way, it cannot be seen in the model that the projects of the companies make a significant effort not to divert their environmental costs to suppliers ($\lambda=.58$). Contrary to what is suggested in the principles of sustainability, priority will probably be given to contracting suppliers with low prices, but high social and environmental costs assumed by society.

These data are consistent with the lack of sustainability focus in the financial dimension. If the projects reflect that they divert to the suppliers the socio-environmental costs ($\lambda=.58$), that externalize the sustainable impacts to the clients ($\lambda=.068$) or that do not motivate the consumer to take responsibility for their consumption at the close of the project or in the operative phase ($\lambda=.046$), then it makes sense that the variable Appropriate Distribution and Account for Impacts, theoretically belonging to the financial dimension, are not reflected in the projects of GRI reports and consequently in the Confirmatory Factorial Analysis of the M2 model (Figure 38).

Another point to be highlighted, and equally important, is the covariance, which can be observed among the factors of the first-order CFA (Figure 38). The covariance between the Value Proposition and the Consumer Interface is significant ($\phi= 0.81$). The covariance between the Supply Chain and the Value Proposition is ($\phi= 0.3$) and the covariance between the Supply Chain and the Customer Interface is ($\phi= 0.5$). This could be interpreted as the sustainability of projects emphasizes value delivery and customer relationships. However, sustainability is observed to a lesser extent in the supply chain.

8. The differences between the framework derived from theory and the model derived from data analysis



Thesis Navigation Map 10 Graphical Representation of the Model Inference from Data Analysis.

After completing the Literature Review, Chapter II presented the analytical framework for assessing the sustainable business model at the project level. Then, the framework was used to propose a business model for sustainability canvas (Figure 41).

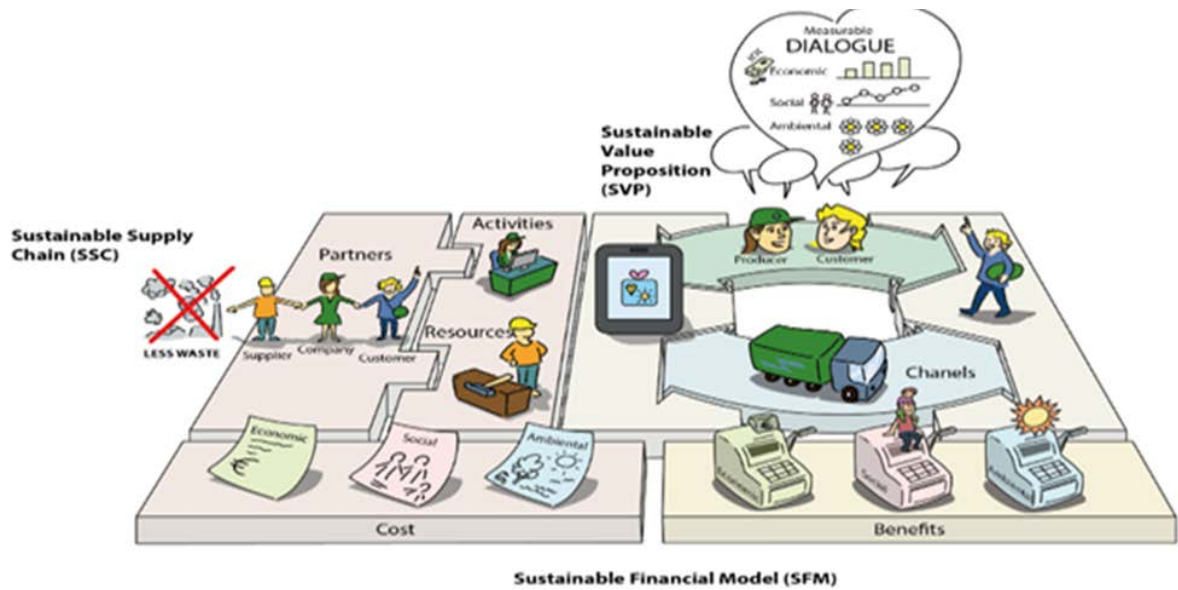


Figure 41. Sustainable Business Model at Project Level: The Theory

Chapter III presented the 10 analytical categories derived from the framework. Each category was paired with a variable (Figure 36) and was used to analyse the projects. After carrying out the statistical treatment of the database, chapter IV discarded 3 of the 10 variables. The remaining 7 variables would reflect the concepts of sustainability in the projects.

The Figure 42 shows how the new canvas would look. This time, from the data. First, the accounting of social, environmental and economic impacts is not reflected in the financial block. Similarly, it does not reflect the proper distribution of benefits or the dialogue that should exist between the company and the project stakeholders.

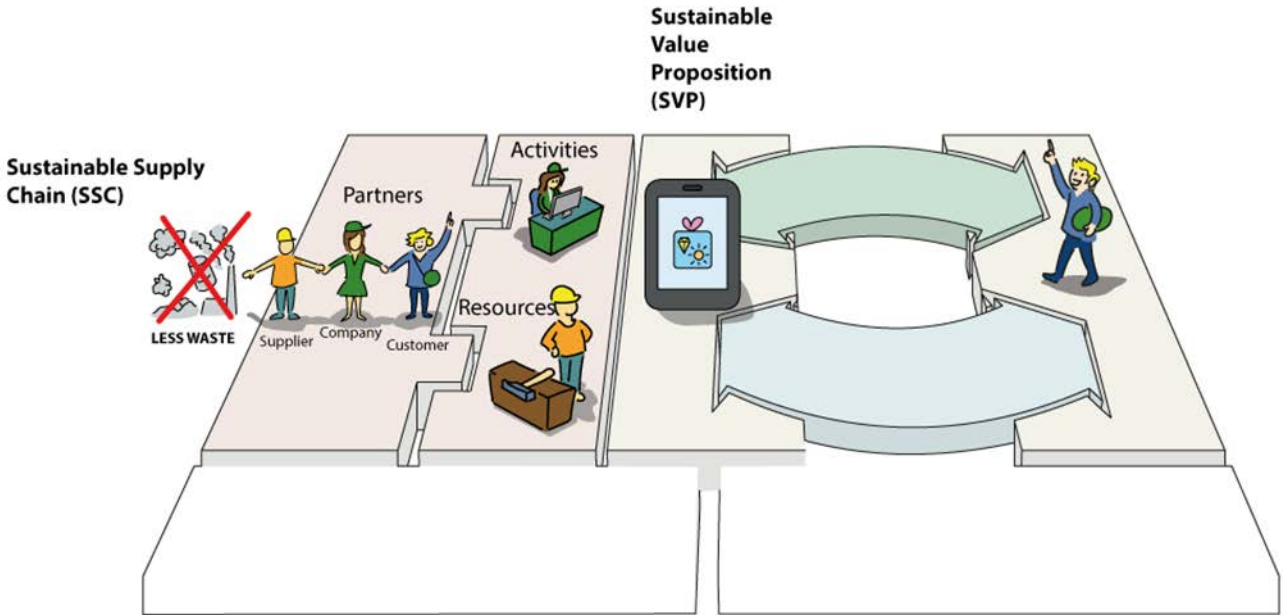


Figure 42. Sustainable Business Model at Project Level: What GRI companies say? Source: The author

Sustainability in interface with the consumer is reflected in projects. The customer is more motivated to participate in the recycling of products and more attentive to perceiving if the company generates waste. These activities strengthen business-client relationships.

In the value proposition, metrics on socio-environmental impact exist but are not communicated in a two-way dialogue with project stakeholders.

The projects also demonstrate sustainability concepts in the supply chain. The data suggest that there is an effort not to divert pollution to external stakeholders. The results also suggest that project suppliers and key partners also integrate company sustainability principles.

In conclusion, it could be suggested that GRI companies' projects reflect an incomplete business model through the lens of a sustainable business model.

V. CONCLUSION

In this study, the analytical tool known as the sustainable innovation business model was used to observe the use, by socio-environmentally aware companies, of projects for their sustainable development. The sustainable innovation business model describes the requirements that must be integrated into its four components: value proposition, supply chain, consumer interface and financial model.

Geissdoerfer et al (2018) state that there is a gap between the design of the strategy and its implementation. To address this gap, managers introduce changes through projects. This study has shown that the business model is a useful analytical tool for assessing the sustainability orientation of projects. It has been concluded that the existence of the sustainable business model is evident at the project level, that it is a multidimensional concept and that its dimensions are interrelated. Analysing, through the business model, how projects articulate their activities to create value allows us to know if the results have a positive influence on suppliers, stakeholders and the environment.

This research complements one of the most cited theories within this area of study. Boons and Lüdeke-Freund (2013) formulated four proposals for sustainable innovation, one for each element of the business model: The Supply Chain, the Value Proposition, the Financial Model, and the Consumer Interface. So far, empirical studies describing

sustainable business models are case studies (Battistella, Cagnina, Cicero, & Preghenella, 2018). This study provides the quantitative demonstration that serves to generalize the results. At the methodological level, this study proposes a mixed method that operates theoretical concepts in measurable variables: the quantitative analysis of contents.

The proposed methodology - quantitative analysis of contents – has been applied to explore the contents of the GRI G4 integrated reports. Taking as a reference the projects published in those reports, three areas of the business model appear as being affected by the sustainability impulse. These areas are the Supply Chain, the Value Proposition, and the Consumer Interface. There is not enough evidence to suggest that sustainable criteria are implemented in the Financial Model component of the Sustainable Innovation Business model.

This analysis contributes to the study area of Sustainable Project Management because, as seen in the chapter on methodology, the nature of research in this field is still interpretative and there are not enough empirical studies.

At a theoretical level, it also complements the studies of the Scandinavian School of Project Management. They suggested, through multiple case studies, that the business model exists at the project level, but limited their research to the economic dimension, without considering environmental and social aspects.

Knowledge about how to deliver sustainable value through sustainability is important because project managers are in charge of carrying out the guidelines of senior managers, where strategies and business models are designed. If we accept that projects are drivers of change inside and outside organizations, society has a broad path to educate project managers on the principles of sustainability.

This study has limitations. First, those of a content analysis in documents that do not contain all the information of the company, only those that they wish to share. This methodology has been useful for making a quantitative proposal and making inferences from companies participating in the same initiative to communicate their results. However, it is important to bear in mind that the information provided is incomplete and only reveals what companies are interested in communicating.

Second, the study was done over the GRI reports published in 2015. Since then, Climate change and Global warming have gained relevance in the Society agenda. Subsequently, importance of sustainability focus into Project Management theory and practice has also shown a relevant increase in last years.

It is possible to suggest several proposals for future research:

- This thesis has focused on solving the question of what concepts of sustainability companies reflect. To answer this question, a factorial analysis was carried out that found relationships between the variables.

This is an R-type factorial analysis. However, other statistical techniques, such as cluster analysis, might answer the question: Which companies develop projects with similar behaviour towards sustainability? This analysis could identify groups of companies with sustainability behavioural typologies and create some perspectives to develop theory.

- The proposed framework for project evaluation has been applied only to companies that call themselves sustainable. It would be interesting to use the framework in other contexts to observe differences in business models. On the other hand, it should be borne in mind that the companies analysed have already been operating in the market for some years. However, there are companies with new sustainable business models that have recently entered the market thanks to project-based ventures.
- Data collection has been carried out by content analysts of GRI reports. The application of the framework, through a survey of project managers, could serve to understand their interpretation of business models and how they integrate sustainability criteria. This would serve to contrast their opinions with the results of this research.

Appendix A

Selected documents to evaluate the Research Methodologies adopted by the authors

Al-Saleh, Y. M., & Taleb, H. M. (2010). The integration of sustainability within value management practices: A study of experienced value managers in the GCC countries. *Project Management Journal*, 41(2), 50-59. doi:10.1002/pmj.20147

Brones, F., de Carvalho, M. M., & de Senzi Zancul, E. (2014). Ecodesign in project management: A missing link for the integration of sustainability in product development? *Journal of Cleaner Production*, 80, 106-118. doi:http://dx.doi.org/10.1016/j.jclepro.2014.05.088

Brones, F., & Monteiro de Carvalho, M. (2015). From 50 to 1: Integrating literature toward a systemic ecodesign model. *Journal of Cleaner Production*, 96, 44-57. doi:http://dx.doi.org/10.1016/j.jclepro.2014.07.036

Eskerod, P., & Huemann, M. (2013). Sustainable development and project stakeholder management: What standards say. *International Journal of Managing Projects in Business*, 6(1), 36-50.

Fernández-Sánchez, G., & Rodríguez-López, F. (2010). A methodology to identify sustainability indicators in construction project management - application to

infrastructure projects in Spain. *Ecological Indicators*, 10(6), 1193-1201.
doi:10.1016/j.ecolind.2010.04.009

Herazo, B., Lizarralde, G., & Paquin, R. (2012). Sustainable development in the building sector: A canadian case study on the alignment of strategic and tactical management. *Project Management Journal*, 43(2), 84-100. doi:10.1002/pmj.21258

Hwang, B. -, & Ng, W. J. (2013). Project management knowledge and skills for green construction: Overcoming challenges. *International Journal of Project Management*, 31(2), 272-284. doi:10.1016/j.ijproman.2012.05.004

Ki Fiona Cheung, Y., & Rowlinson, S. (2011). Supply chain sustainability: A relationship management approach. *International Journal of Managing Projects in Business*, 4(3), 480-497. doi:10.1108/175383711111144184

Lee, G. K., & Chan, E. H. (2010). Evaluation of the urban renewal projects in social dimensions. *Property Management*, 28(4), 257-269.

Lenferink, S., Tillema, T., & Arts, J. (2013). Towards sustainable infrastructure development through integrated contracts: Experiences with inclusiveness in dutch infrastructure projects. *International Journal of Project Management*, 31(4), 615-627.
doi:10.1016/j.ijproman.2012.09.014

Loosemore, M. (2016). Social procurement in UK construction projects. *International Journal of Project Management*, 34(2), 133-144. doi:10.1016/j.ijproman.2015.10.005

Martens, M. L., & Carvalho, M. M. The challenge of introducing sustainability into project management function: Multiple-case studies. *Journal of Cleaner Production*, doi:http://dx.doi.org/10.1016/j.jclepro.2015.12.039

Mysen, T. (2012). Sustainability as corporate mission and strategy. *European Business Review*, 24(6), 496-509. doi:10.1108/09555341211270519

Reed, M. G., Godmaire, H., Abernethy, P., & Guertin, M. -. (2014). Building a community of practice for sustainability: Strengthening learning and collective action of canadian biosphere reserves through a national partnership. *Journal of Environmental Management*, 145, 230-0239. doi:10.1016/j.jenvman.2014.06.030

Sánchez, M. A. (2015). Integrating sustainability issues into project management. *Journal of Cleaner Production*, 96, 319-330.

Shen, L., Jiao, L., He, B., & Li, L. (2015). Evaluation on the utility efficiency of metro infrastructure projects in china from sustainable development perspective. *International Journal of Project Management*, 33(3), 528-536. doi:10.1016/j.ijproman.2014.07.005

Verrier, B., Rose, B., & Caillaud, E. (2016). Lean and green strategy: The lean and green house and maturity deployment model. *Journal of Cleaner Production*, 116, 150-156.

Vifell, A. C., & Soneryd, L. (2012). Organizing matters: How 'the social dimension' gets lost in sustainability projects. *Sustainable Development*, 20(1), 18-27. doi:10.1002/sd.461

Xue, X., Zhang, R., Zhang, X., Yang, R. J., & Li, H. (2015). Environmental and social challenges for urban subway construction: An empirical study in china. *International Journal of Project Management*, 33(3), 576-588.

Zeng, S. X., Ma, H. Y., Lin, H., Zeng, R. C., & Tam, V. W. Y. (2015). Social responsibility of major infrastructure projects in china. *International Journal of Project Management*, 33(3), 537-548. doi:10.1016/j.ijproman.2014.07.007

Zhang, X., Wu, Y., Shen, L., & Skitmore, M. (2014). A prototype system dynamic model for assessing the sustainability of construction projects. *International Journal of Project Management*, 32(1), 66-76. doi:10.1016/j.ijproman.2013.01.009

Appendix B

Data obtained from the Content Analysis of GRI Reports

COMPANY	Sector	Country	PROJECT	MV	SD	B	KP	KS	MC	NS	CR	AD	AI
Ahlstom	Forest and Paper Products	Finland	Water in India (foundation)	0	0	1	1	1	1	1	1	1	0
Ahlstom	Forest and Paper Products	Finland	Clean water in East Africa	1	1	0	0	0	1	1	1	0	1
Asian	Financial		Infrastructure in Sri Lanka										
Alliance Insurance	Services	Sri Lanka	(development)	0	1	0	0	0	1	1	1	0	0
Asian	Financial		Improving environmental awareness										
Alliance Insurance	Services	Sri Lanka		0	1	0	1	0	0	1	0	0	0
Asian	Financial		Incorporating environmental standards into supplier engagements										
Alliance Insurance	Services	Sri Lanka		1	1	1	1	1	0	0	1	0	1
Asian	Financial		Horton Plain's Bags project										
Alliance Insurance	Services	Sri Lanka		1	1	1	0	0	1	0	1	0	0
Hochtief	Construction	Germany	Carbon Disclosure Project (CDP)	0	1	0	1	0	0	0	1	0	0
Hochtief	Construction	Germany	PPP transportation infrastructure projects	0	1	0	0	0	1	0	0	0	0
Hochtief	Construction	Germany	PPP social and urban infrastructure projects	0	1	0	0	0	0	0	0	1	0
Hochtief	Construction	Germany	Resumption of construction work on Greek toll road projects	0	1	1	0	0	0	0	1	1	0
Hochtief	Construction	Germany	Climate Protection	0	0	0	0	1	0	0	0	1	0
Hochtief	Construction	Germany	World-class architecture in Australia	0	0	0	0	1	0	1	0	0	0
Hochtief	Construction	Germany	Musical Theater in Hamburg	0	0	0	1	1	0	1	0	0	0
Hochtief	Construction	Germany	Products and Services	0	0	0	0	0	1	0	1	0	0
Hochtief	Construction	Germany	Corporate Citizenship	0	0	1	0	0	1	1	0	1	0

			Bridging the gap to nature in										
Hochtief	Construction	Germany	Scotland	0	1	0	0	0	1	0	0	1	0
Hochtief	Construction	Germany	Energy infrastructure projects	0	0	0	0	0	0	0	0	0	0
			The fast lane to total mobility in										
Hochtief	Construction	Germany	New Zealand	0	1	1	0	1	0	0	0	0	0
Bombardier	Conglomerates	Canada	Rail transportation	1	0	0	1	0	0	0	1	0	0
Bombardier	Conglomerates	Canada	The Haramain Project	1	0	0	0	0	1	0	0	1	0
Bombardier	Conglomerates	Canada	Solar farm Project	1	0	1	0	1	0	0	0	0	0
KPN	Telecommunications	Netherlands	Research Project	1	1	1	0	0	1	1	0	0	0
KPN	Telecommunications	Netherlands	KPN Schoon' IT security	1	0	0	1	0	0	0	0	1	0
KPN	Telecommunications	Netherlands	Carbon Disclosure Project	1	1	1	0	1	0	0	1	1	0
KPN	Telecommunications	Netherlands	Digital transformation Project	1	0	0	0	0	0	1	0	1	0
Palfinger	Construction Materials	Austria	Offshore wind energy project	1	0	0	0	1	1	0	0	1	0
Palfinger	Construction Materials	Austria	Development Projects	0	0	0	1	1	0	0	1	0	1
Palfinger	Construction Materials	Austria	Cooperation Projects	1	0	0	1	0	1	0	1	0	1
Palfinger	Construction Materials	Austria	Construction of a new production plant in Rudong	0	1	0	1	0	1	1	1	0	0
Palfinger	Construction Materials	Austria	PALplus Project	1	0	0	0	1	0	0	0	1	0
Philips	Consumer Durables	Netherlands	Carbon Disclosure Project	0	0	0	0	0	0	0	0	0	0
Philips	Consumer Durables	Netherlands	CV Project	1	0	0	1	1	0	1	1	0	1
Philips	Consumer Durables	Netherlands	Lighting and Healthcare Project	0	1	1	1	1	0	1	0	1	0
Philips	Consumer Durables	Netherlands	Consumer lifestyle structuring	1	0	1	1	0	0	1	1	1	0

Philips	Consumer Durables	Netherlands	Health and Safety Management in Turnkey	1	0	0	0	0	1	0	0	0	1
Philips	Consumer Durables	Netherlands	Innovation, Group & Services restructuring Projects	0	0	1	0	1	0	0	0	0	0
Royal BAM Group	Construction	Netherlands	PPP project Renovation	1	0	0	0	1	1	0	0	1	0
Royal BAM Group	Construction	Netherlands	SMART Noordtunnel project in Kuala Lumpur	1	1	0	1	1	1	0	0	0	0
Royal BAM Group	Construction	Netherlands	Design and construction of A4 highway road-widening project in Netherlands	0	1	0	1	1	0	0	0	1	0
Royal BAM Group	Construction	Netherlands	University Hospital Schleswig-Holstein (UHS) in Germany	0	1	0	0	0	0	1	1	0	0
Royal BAM Group	Construction	Netherlands	Schools Bundle 4 (SB4) in Ireland	0	1	0	0	0	0	0	1	1	0
Royal BAM Group	Construction	Netherlands	OV SAAL project of ProRail	0	1	0	1	0	1	0	0	1	0
Royal BAM Group	Construction	Netherlands	Rail project Randstadrail	0	1	1	1	1	1	0	0	0	1
Royal BAM Group	Construction	Netherlands	Brummen Town Hall project in Netherlands	0	0	1	1	1	1	1	1	1	0
Royal BAM Group	Construction	Netherlands	HESMOS project	1	1	0	1	1	0	0	0	0	0
Royal BAM Group	Construction	Netherlands	The LE2AP project BAM Infraconsult apply augmented reality at civil engineering projects	0	0	0	0	1	0	1	0	0	0
Royal BAM Group	Construction	Netherlands		0	0	1	0	0	0	1	1	0	0
Unicredit (Lean Six Sigma)	Financial Services	Italy	Klientomania Project	1	1	0	0	1	1	1	0	0	0
Unicredit (Lean Six Sigma)	Financial Services	Italy	Agromania Project	1	0	0	1	1	0	0	1	0	0
Unicredit (Lean Six Sigma)	Financial Services	Italy	Matrix certification Project	0	1	0	0	0	0	0	1	1	1

LKAB	Mining	Sweden	Biodiversity project	1	0	1	0	0	1	1	0	1	0
LKAB	Mining	Sweden	BasEl Project	1	1	1	1	0	0	0	1	1	1
LKAB	Mining	Sweden	High iron content and less quartz Building	1	0	1	0	1	0	0	0	0	0
Fortum	Energy	Finland	fishways for our power plant Construction of air-cooled cooling towers	0	1	1	1	0	0	1	0	1	0
Fortum	Energy	Finland	towers	1	1	0	1	0	0	1	1	0	0
Fortum	Energy	Finland	New heat pump plant Sustainable urban living in Stockholm	1	1	0	1	1	1	1	0	1	1
Fortum	Energy	Finland	Stockholm	0	1	0	0	0	0	0	0	0	0
Fortum	Energy	Finland	Catalytic pyrolysis technology for refining bio-oil	1	1	1	0	0	1	1	0	1	1
Fortum	Energy	Finland	Smart grid and analysis of the residential carbon footprint Implementation of tracking systems	0	1	0	0	0	0	0	0	0	0
Konecranes	Logistics	Finland	systems	0	1	0	1	1	1	0	1	1	1
Konecranes	Logistics	Finland	Renewal of the HVAC system	1	1	0	1	1	1	0	0	1	1
Nordgold Management	Mining	Russian Federation	BSN implementation	1	1	0	0	1	0	0	0	1	1
Nordgold Management	Mining	Russian Federation	Usage of solar energy	0	1	0	1	1	0	0	0	1	1
Nordgold Management	Mining	Russian Federation	Supply of energy efficient lamps	0	1	0	1	1	0	0	0	1	1
Nordgold Management	Mining	Russian Federation	Medical project Lefa case	0	1	0	0	0	0	0	0	0	1
SKF Group (Lean Six Sigma)	Metals Products	Sweden	“More with SKF” framework implementation	1	1	1	1	0	1	1	1	1	0
SKF Group (Lean Six Sigma)	Metals Products	Sweden	SKF WindCon	1	1	1	0	0	1	1	1	1	1

SKF Group (Lean Six Sigma)	Metals Products	Sweden	"Smart" bearings	1	1	1	1	0	1	1	1	1	1
SKF Group (Lean Six Sigma)	Metals Products	Sweden	Manufacturing facility in the Czech Republic	1	1	1	0	1	0	1	1	1	1
SKF Group (Lean Six Sigma)	Metals Products	Sweden	"Wissenwerkstatt" project	0	1	0	0	0	0	0	0	0	0
SKF Group (Lean Six Sigma)	Metals Products	Sweden	The Siirt Project in Turkey	0	1	0	0	0	0	0	0	0	0
SKF Group (Lean Six Sigma)	Metals Products	Sweden	afforestation project in Northeast China	0	1	0	0	0	0	0	0	0	0
Accenture Spain	Commercial Services	Spain	"Federaciones de negocios"	0	1	0	0	0	1	1	1	1	1
Accenture Spain	Commercial Services	Spain	Emplea +	0	1	0	0	0	0	0	0	0	0
Accenture Spain	Commercial Services	Spain	Mamás Luz en Guinea Conakry	0	1	0	0	0	0	0	0	0	0
Accenture Spain	Commercial Services	Spain	Pprograma SAT de educación	0	1	0	0	0	0	0	0	0	0
Accenture Spain	Commercial Services	Spain	Proyecto INSERTA	0	1	0	0	0	0	0	0	0	0
Akzo Nobel NV	Chemicals	Netherlands	Human Cities initiative implementation of the AkzoNobel	0	1	0	0	0	0	0	0	0	0
Akzo Nobel NV	Chemicals	Netherlands	Leading Performance System (ALPS)	0	1	0	1	1	1	0	0	1	1
Akzo Nobel NV	Chemicals	Netherlands	Coating for cold drinks paper cups	1	1	1	0	0	1	0	1	1	1
Akzo Nobel NV	Chemicals	Netherlands	Fit by Marshall brand in Turkey	1	1	1	1	1	0	0	1	0	1
Akzo Nobel NV	Chemicals	Netherlands	Visualizer app	0	1	0	1	0	1	1	1	0	0
Akzo Nobel NV	Chemicals	Netherlands	New products for agrochemicals	0	1	1	1	1	1	1	0	1	0

AXTEL	Telecomunica tions	Mexico	Desarrollo del canal de venta en línea	0	1	0	0	0	1	0	0	1	1
AXTEL	Telecomunica tions	Mexico	Talleres de Sensibilización a la Discapacidad	0	1	0	0	0	0	0	0	0	0
AXTEL	Telecomunica tions	Mexico	Cobertón AXTEL	0	1	0	0	0	0	0	0	0	0
AXTEL	Telecomunica tions	Mexico	Servicio Seguridad Hogar	0	1	0	0	0	1	0	0	1	0
AXTEL	Telecomunica tions	Mexico	Biblioteca AXTEL	0	1	0	0	0	0	0	0	0	0
AXTEL	Telecomunica tions	Mexico	Programa de nutrición a nivel nacional	0	1	0	0	0	0	0	0	0	0
AXTEL	Telecomunica tions	Mexico	Día de la Familia	0	1	0	0	0	0	0	0	0	0
AXTEL	Telecomunica tions	Mexico	Implementación de energía eólica Gela project	0	1	1	1	0	1	0	0	1	1
Eni S.P.A.	Energy	Italy	Action Plan for Biodiversity in Val d'Agri	1	1	0	1	1	1	1	1	0	1
Eni S.P.A.	Energy	Italy	Innovative environmental monitoring system	0	1	0	0	0	0	0	0	0	1
John Keells Group	Conglomerates	Sri Lanka	Elephant Research Project	0	1	0	0	0	0	0	0	0	1
John Keells Group	Conglomerates	Sri Lanka	Circulation of Board papers in electronic format	0	1	1	1	1	0	1	1	0	1
John Keells Group	Conglomerates	Sri Lanka	Supplier assessment	0	1	0	1	1	0	0	0	1	1
John Keells Group	Conglomerates	Sri Lanka	Online booking platform	0	1	0	0	0	0	0	0	1	0
John Keells Group	Conglomerates	Sri Lanka	Building energy management system	0	1	0	1	1	1	1	1	1	0
John Keells Group	Conglomerates	Sri Lanka	Solar panels on the rooftop	0	1	0	1	1	1	1	1	1	0
John Keells Group	Conglomerates	Sri Lanka	Waste segregation strategy	0	1	0	0	0	0	0	0	0	1
John Keells Group	Conglomerates	Sri Lanka	Heat insulation project	0	1	0	0	0	0	0	0	0	1
John Keells Group	Conglomerates	Sri Lanka	Industrial Tours for University Undergraduates	0	1	0	0	0	0	0	0	0	0
John Keells Group	Conglomerates	Sri Lanka	Neighbourhood Schools	0	1	0	0	0	0	0	0	0	0

John Keells Group	Conglomerates	Sri Lanka	John Keells Vision Project Caring for lives at Yala National Park	0	1	0	0	0	0	0	0	0	0
John Keells Group	Conglomerates	Sri Lanka	Park	0	1	0	0	0	0	0	0	0	0
John Keells Group	Conglomerates	Sri Lanka	Youth Development Project	0	1	0	0	0	0	0	0	0	0
Grupo Marfrig	Food and Beverage Products	Brazil	Marfrig+ Program	0	0	0	0	0	0	0	0	0	0
Grupo Marfrig	Food and Beverage Products	Brazil	Trading Desk	0	1	0	1	1	0	0	0	1	1
Grupo Marfrig	Food and Beverage Products	Brazil	Suppliers independent audits	0	1	0	1	1	0	0	0	1	1
Grupo Marfrig	Products	Brazil	Eliminate the solid waste	0	1	0	1	1	0	1	0	1	1
SAP	Other	Germany	Autism at Work initiative	0	1	0	0	0	0	0	0	0	0
SAP	Other	Germany	In-depth personalhealth profile	0	1	0	0	0	0	0	0	0	0
Telefonica	Telecommunica tions	Spain	Health Examination framework	0	1	0	0	0	0	0	0	0	0
Telefonica	Telecommunica tions	Spain	'Feel Good' programme	0	1	0	0	0	0	0	0	0	0
Telefonica	Telecommunica tions	Spain	'District Challenge' initiative	0	1	0	0	0	0	0	0	0	0
Telefonica	Telecommunica tions	Spain	e-learning training model	0	1	0	0	0	0	0	0	0	0
Telefonica	Telecommunica tions	Spain	Virtual classrooms	0	1	0	0	0	0	0	0	0	0
Telefonica	Telecommunica tions	Spain	Telefónica Deutschland community of mothers and fathers	0	1	0	0	0	0	0	0	0	0
Telefonica	Telecommunica tions	Spain	Electronic catalogues	0	1	0	1	0	1	0	0	0	0
Telefonica	Telecommunica tions	Spain	Workshop with partners in critical activities	0	1	0	0	0	0	0	0	0	0

Telefonica	Telecommunications	Spain	Improvement of a predictive model	0	1	0	1	1	1	0	0	1	0
Telefonica	Telecommunications	Spain	Industrial Safety and Occupational Health Policy	0	1	0	1	1	0	0	0	0	0
Telefonica	Telecommunications	Spain	Digital Family portal	0	1	0	0	0	0	0	0	0	0
Telefonica	Telecommunications	Spain	Ability Challenge	0	1	0	0	0	0	0	0	0	0
Triglav Insurance Company	Financial Services	Slovenia	Awareness-raising campaign	0	1	0	0	0	0	0	0	0	0
Triglav Insurance Company	Financial Services	Slovenia	Centralised document printing	0	1	0	0	1	0	0	0	0	0
Triglav Insurance Company	Financial Services	Slovenia	Healthy Workplace 2014–2015	0	1	0	0	0	0	0	0	0	0
Triglav Insurance Company	Financial Services	Slovenia	COPS@road system	0	1	0	0	0	0	0	0	0	0
Triglav Insurance Company	Financial Services	Slovenia	Children of Triglav project	0	1	0	0	0	0	0	0	0	0
Engro Corporation	Construction	Pakistan	Top Talent Mentorship Program	0	1	0	0	0	0	0	0	0	0
Engro Corporation	Construction	Pakistan	Setting up schools in Nara Desert	0	1	0	0	0	0	0	0	0	0
Engro Corporation	Construction	Pakistan	Katcha Education Program	0	1	0	0	0	0	0	0	0	0
Engro Corporation	Construction	Pakistan	Waste reduction project	0	1	0	1	1	0	0	0	1	0
Absa	Financial Services	South Africa	'Paperless banking'	1	1	0	1	0	0	1	1	1	0
Absa	Financial Services	South Africa	Supplier code of conduct	0	0	0	1	1	0	1	0	0	0
AEGON	Financial Services	Netherlands	Investments & Retirement	0	0	0	0	0	0	0	0	1	0
AGRANA Group	Food and Beverage Products	Austria	Mont Blanc	0	0	0	0	0	1	0	1	0	0
Ball State University	Universities	United States of America	Blue Bag	0	0	1	0	0	1	0	0	0	0

Ball State University	Universities	United States of America	Dinner in the dark	0	1	0	0	0	1	0	0	0	1
Bankinter	Financial Services	Spain	Oficina sostenible	0	0	0	0	0	0	0	0	0	1
BBVA Bancomer	Services	Mexico	Ecorating	0	0	0	0	0	1	0	1	0	0
COMFANDI	Non-Profit / Services	Colombia	Sist. Regional de Responsabilidad Social	0	0	0	0	0	1	0	1	0	0
DKV Seguros Grupo Cooperativo	Financial Services	Spain	Torre DKV (certif. LEED gold)	0	1	0	1	0	0	0	0	0	1
Cajamar Grupo Cooperativo	Financial Services	Spain	Renove R22	1	1	1	0	0	0	0	0	0	1
Cajamar Grupo Financiero	Financial Services	Spain	Recup. Residuos vegetales	1	1	1	0	0	0	0	0	0	0
Banorte	Services	Mexico	Irrigation modules	1	1	0	0	0	0	0	0	0	1
Indra	Computers	Spain	Software Labs	0	1	0	0	0	1	0	0	0	0
Indra	Computers	Spain	Sensible	0	0	0	0	0	1	0	0	0	0
Indra	Computers	Spain	Decumanus	0	1	0	0	0	0	0	0	0	0
Indra	Computers	Spain	Drones for good	0	1	0	0	0	0	0	0	0	0
AFROX (African Oxygen Limited)	Chemicals	South Africa	Upgrading the capacity of NCP plant	0	1	0	1	0	0	0	0	1	0
Alma Media Group	Media	Finland	Meedio marketing service	0	1	0	1	0	0	0	0	0	0
Alma Media Group	Media	Finland	Online dating service E-kontakti	0	1	0	0	0	0	0	0	0	0
Alma Media Group	Media	Finland	Kauppalehti's digital renewal project	0	1	0	0	0	0	0	0	0	0
Alma Media Group	Media	Finland	Sustainable Media programme	0	1	0	0	0	0	0	0	0	0

Alma Media Group	Media	Finland	Car boot fair in Tampere	0	1	0	0	0	0	0	0	0	0
Alma Media Group	Media	Finland	Youth employment campaign	0	1	0	0	0	0	0	0	0	0
Anglo American Platinum	Mining	South Africa	Employee financial wellness programme	0	1	0	0	0	0	0	0	0	0
Anglo American Platinum	Mining	South Africa	Employee relations programme	0	1	0	0	0	0	0	0	0	0
Anglo American Platinum	Mining	South Africa	Internet-based database of local suppliers	1	1	0	1	1	0	1	0	1	0
Anglo American Platinum	Mining	South Africa	Flagship project	0	1	0	0	0	0	0	0	0	0
Atlantia	Other	Italy	Atlantia for Value “Autostrade for Knowledge” project	0	1	0	0	0	0	0	0	0	0
Atlantia	Other	Italy	Prevention Corner Project	0	1	0	0	0	0	0	0	0	0
Atlantia	Other	Italy	“My Way” TV channel	0	1	0	0	0	0	0	0	0	0
Atlantia	Other	Italy	“You are in a wonderful country” marketing project	0	1	0	0	0	0	0	0	0	0
Atlantia	Other	Italy	“Differentiated waste collection takes off” installation of LED lighting in tunnels	0	1	0	1	0	0	0	0	0	1
Isagen	Energy Utilities	Colombia	Protocolo para remoción, manejo y gestión de sedimentos en embalses	0	1	0	0	0	0	0	1	0	0
Isagen	Energy Utilities	Colombia	Planes de mejoramiento de l/p de gestión energetica de 21 clientes	1	1	0	0	0	1	0	1	0	0
JLL	Real Estate	United States of America	Global Research Project	1	1	0	0	0	0	0	0	0	0
JLL	Real Estate	United States of America	GPT, ISPT and Blackstone buildings	0	1	0	0	0	0	0	0	0	0

KGHM Polska Mied?	Metals Products	Poland	Haulage vehicle CB4-20TB	0	0	1	1	0	1	0	0	0	0
KGHM Polska Mied?	Metals Products	Poland	Sierra Gorda Mine	1	1	0	0	0	0	0	0	0	0
KGHM Polska Mied?	Metals Products	Poland	Innovaion zona	0	1	0	0	0	0	0	0	0	0
KGHM Polska Mied?	Metals Products	Poland	Copper hearth	0	1	0	0	0	0	0	0	0	0
KGHM Polska Mied?	Metals Products	Poland	KGHM Cultura	0	1	0	0	0	0	0	0	0	0
Lafarge	Construction Materials	France	Casablanca Tramway	0	1	0	0	0	0	0	0	0	0
Lafarge	Construction Materials	France	EEB (Energy Efficiency in Building) Project	0	1	0	1	0	0	1	0	0	0
Lafarge	Construction Materials	France	Agroforestry project	0	1	0	0	0	0	0	0	0	0
Lotus Bakeries	Food and Beverage Products	Belgium	Care for Today- Respect for Tomorrow	0	1	0	0	0	0	0	0	0	0
Munich Airport	Aviation	Germany	Conversion Terminal	0	1	0	0	0	0	0	0	0	0
Nandan Group OJSC	Other	India	Automated Truck Loader for the Cement Industry	0	1	0	0	0	1	0	0	0	0
SEVERNEFTEGA ZPROM	Energy	Russian Federatio n	Preparation and treatment of underground water	0	1	0	0	0	0	1	0	0	0
OJSC SEVERNEFTEGA ZPROM	Energy	Russian Federatio n	assessment of anthropogenic impact on the environment	0	1	0	0	0	0	1	0	0	0

References

- "Project management and sustainable development". A special issue of *sustainability* (ISSN 2071-1050). Retrieved from http://www.mdpi.com/journal/sustainability/special_issues/Project_Management
- Aaltonen, P. (2015). Project business research group. Retrieved from <http://pbgroup.aalto.fi/en/>
- Aarseth, W., Ahola, T., Aaltonen, K., Økland, A., & Andersen, B. (2017). *Project sustainability strategies: A systematic literature review*
doi:<https://doi.org/10.1016/j.ijproman.2016.11.006>
- Abdi, A., Taghipour, S., & Khamooshi, H. (2018). *A model to control environmental performance of project execution process based on greenhouse gas emissions using earned value management*
doi:<https://doi.org/10.1016/j.ijproman.2017.12.003>
- Abidin, N. Z., & Pasquire, C. L. (2007). Revolutionize value management: A mode towards sustainability. *International Journal of Project Management*, 25(3), 275-282.
- Aguilar-Fernandez, M. E., Otegi-Olaso, J. R., & Fuentes-Ardeo, L. (2016a). (2016a). The relationships between sustainable innovation of the customer

interface and the project life cycle. Paper presented at the *EURAM 2016*.

Manageable Cooperation? Paris. Retrieved from <http://www.euram-online.org/annual-conference-2016.html>

Aguilar-Fernandez, M. E., Otegi-Olaso, J. R., & Fuentes-Ardeo, L. (2016b).

Philosophical paradigms in sustainable project management research.

Paper presented at the *Proceedings of the Dortmund International Research Conference 2016*, Dortmund.

Aguilar-Fernández, M., & Otegi-Olaso, J. (2018). Firm size and the business

model for sustainable innovation. *Sustainability*, 10(12), 4785.

Algeo, C. (2014). Exploring project knowledge acquisition and exchange

through action research. *Project Management Journal*, 45(3), 46-56.

doi:10.1002/pmj.21417

Alonso-Almeida, M., Llach, J., & Marimon, F. (2014). A closer look at the 'Global

reporting initiative' sustainability reporting as a tool to implement

environmental and social policies: A worldwide sector analysis. *Corporate*

Social Responsibility and Environmental Management, 21(6), 318-335.

Al-Saleh, Y. M., & Taleb, H. M. (2010). The integration of sustainability within

value management practices: A study of experienced value managers in the

GCC countries. *Project Management Journal*, 41(2), 50-59.

doi:10.1002/pmj.20147

Andersen, E. S. (2016). *Do project managers have different perspectives on project management?* doi:<https://doi.org/10.1016/j.ijproman.2015.09.007>

Artto, K. A., & Wikström, K. (2005). What is project business? *International Journal of Project Management*, 23(5), 343-353.

Artto, K., & Kujala, J. (2008). Project business as a research field. *International Journal of Managing Projects in Business*, 1(4), 469-497.

doi:10.1108/17538370810906219

Bal, M., Bryde, D., Fearon, D., & Ochieng, E. (2013). Stakeholder engagement: Achieving sustainability in the construction sector. *Sustainability (Switzerland)*, 5(2), 695-710. doi:10.3390/su5020695

Battistella, C., Cagnina, M., Cicero, L., & Preghenella, N. (2018). Sustainable business models of SMEs: Challenges in yacht tourism sector. *Sustainability*, 10(10), 3437.

Biedenbach, T., & Müller, R. (2011). Paradigms in project management research: Examples from 15 years of IRNOP conferences. *International Journal of Managing Projects in Business*, 4(1), 82-104.

- Biondi, V., Iraldo, F., & Meredith, S. (2002). Achieving sustainability through environmental innovation: The role of SMEs. *International Journal of Technology Management*, 24(5-6), 612-626.
- Bistrova, J., & Lace, N. (2011). In Soliman K. (Ed.), *The model of sustainable shareholder value*. NORRISTOWN; 34 E GERMANTOWN PIKE, NO. 327, NORRISTOWN, PA 19401 USA: INT BUSINESS INFORMATION MANAGEMENT ASSOC-IBIMA.
- Bocken, N. M. P., & Allwood, J. M. (2012). *Strategies to reduce the carbon footprint of consumer goods by influencing stakeholders*
doi:<https://doi.org/10.1016/j.jclepro.2012.05.031>
- Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42-56. doi:10.1016/j.jclepro.2013.11.039
- Boons, F., & Lüdeke-Freund, F. (2013). Business models for sustainable innovation: State-of-the-art and steps towards a research agenda. *Journal of Cleaner Production*, 45, 9-19. doi:10.1016/j.jclepro.2012.07.007
- Boons, F., Montalvo, C., Quist, J., & Wagner, M. (2013). Sustainable innovation, business models and economic performance: An overview. *Journal of*

Cleaner Production, 45(0), 1-8.

doi:<http://dx.doi.org/10.1016/j.jclepro.2012.08.013>

Bos-Brouwers, H. E. J. (2010). Corporate sustainability and innovation in SMEs: Evidence of themes and activities in practice. *Business Strategy and the Environment*, 19(7), 417-435.

Bouncken, R. B., & Fredrich, V. (2016). Business model innovation in alliances: Successful configurations. *Journal of Business Research*, 69(9), 3584-3590.

Brady, T., Davies, A., & Gann, D. M. (2005). *Creating value by delivering integrated solutions* doi:<https://doi.org/10.1016/j.ijproman.2005.01.001>

Briongos-Vázquez, N., Otegi-Olaso, J. R., & Martínez-León, L. (2016). The construction of research questions in sustainable project management . Paper presented at the *Proceedings of the Dortmund International Research Conference 2016*, Dortmund.

Brones, F., de Carvalho, M. M., & de Senzi Zancul, E. (2014). Ecodesign in project management: A missing link for the integration of sustainability in product development? *Journal of Cleaner Production*, 80, 106-118.

doi:<http://dx.doi.org/10.1016/j.jclepro.2014.05.088>

- Brook, J. W., & Pagnanelli, F. (2014). Integrating sustainability into innovation project portfolio management—A strategic perspective. *Journal of Engineering and Technology Management*, 34, 46-62.
- Bryman, A. (2007). Barriers to integrating quantitative and qualitative research. *Journal of Mixed Methods Research*, 1(1), 8-22.
- Cameron, R., Sankaran, S., & Scales, J. (2015). Mixed methods use in project management research. *Project Management Journal*, 46(2), 90-104.
- Carbonara, N., Costantino, N., & Pellegrino, R. (2014). Concession period for PPPs: A win-win model for a fair risk sharing. *International Journal of Project Management*, 32(7), 1223-1232.
- Carboni, J., Gonzalez, M., & Hodgkinson, J. (2013). The GPM reference guide to sustainability in project management. *Green Project Management (GPM)*,
- Carvalho, M. M. d., Martens, M. L., Morioka, S. N. & Rabechini, R. Sustainability & project management: Towards an integrated model. Retrieved from <https://www.researchgate.net/project/CNPq-Universal-Sustentabilidade-Gestao-de-Projetos-proposicao-de-um-modelo-integrado-Sustainability-Project-Management-Towards-an-Integrated-Model>
- CASTALDO, D., & REALE, A. (2011). *Project management sustainability. planning, analysis and control project sustainability environmental*

- Ceschin, F. (2013). *Critical factors for implementing and diffusing sustainable product-service systems: Insights from innovation studies and companies' experiences* doi:<https://doi.org/10.1016/j.jclepro.2012.05.034>
- Cheng, C. C. J., Yang, C., & Sheu, C. (2014). The link between eco-innovation and business performance: A taiwanese industry context. *Journal of Cleaner Production*, 64(0), 81-90. doi:<http://dx.doi.org/10.1016/j.jclepro.2013.09.050>
- Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: Evidence from xerox corporation's technology spin-off companies. *Industrial and Corporate Change*, 11(3), 529-555.
- Cooke, P., & Wills, D. (1999). Small firms, social capital and the enhancement of business performance through innovation programmes. *Small Business Economics*, 13(3), 219-234.
- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches* Sage publications.
- Del Mar Alonso-Almeida, M., Llach, J., & Marimon, F. (2014). A closer look at the 'global reporting initiative' sustainability reporting as a tool to implement environmental and social policies: A worldwide sector analysis.

Corporate Social Responsibility and Environmental Management, 21(6), 318-335.

doi:10.1002/csr.1318

Ebbesen, J. B., & Hope, A. (2013). Re-imagining the iron triangle: Embedding sustainability into project constraints. *PM World Journal*, 2(III)

Eccles, R. G., & Krzus, M. P. (2014). *The integrated reporting movement: Meaning, momentum, motives, and materiality* John Wiley & Sons.

Eccles, R. G., & Serafeim, G. (2013). The performance frontier: Innovating for a sustainable strategy. *Harvard Business Review*, 91(5)

Elkington, J. (1997). Cannibals with forks. *The Triple Bottom Line of 21st Century*,

Elkington, J. (1998a). Accounting for the triple bottom line. *Measuring Business Excellence*, 2(3), 18-22.

Elkington, R., & Upward, A. (2016). Leadership as enabling function for flourishing by design. *Journal of Global Responsibility*, 7(1), 126-144.

Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review*, 36(2), 90-100. doi:10.2307/41165746

Eskerod, P., & Huemann, M. (2013). Sustainable development and project stakeholder management: What standards say. *International Journal of Managing Projects in Business*, 6(1), 36-50.

Eskerod, P., & Riis, E. "Special issue" sustainable development and project stakeholder management.

Eskerod, P., & Huemann, M. (2013). Sustainable development and project stakeholder management: What standards say. *International Journal of Managing Projects in Business*, 6(1), 36-50. doi:10.1108/17538371311291017

Eskerod, P., Huemann, M., & Ringhofer, C. (2015). Stakeholder inclusiveness: Enriching project management with general stakeholder theory. *Project Management Journal*, doi:10.1002/pmj.21546

Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability: Towards a unified perspective for creation of sustainable business models. *Business Strategy and the Environment*, 26(5), 597-608.

Fatemi, A. M., & Fooladi, I. J. (2013). Sustainable finance: A new paradigm. *Global Finance Journal*, 24(2), 101-113.
doi:<http://dx.doi.org/10.1016/j.gfj.2013.07.006>

- Fuentes-Ardeo, L., Otegi-Olaso, J. R., & Aguilar-Fernandez, M. E. (2016). The action research methodology applied for analyzing how to integrate sustainability into project management. Paper presented at the *Proceedings of the Dortmund International Research Conference 2016*, Dortmund.
- Gareis, R., Heumann, M., & Martinuzzi, A. (2009). Relating sustainable development and project management. *IRNOP IX, Berlin*,
- Gareis, R., Huemann, M., & Martinuzzi, A. (2011). What can project management learn from considering sustainability principles. *Project Perspectives*, 33
- Gareis, R., Huemann, M., & Martinuzzi, A. (2013). Project management and sustainable development principles. Paper presented at the
- Gareis, R. (2010). Changes of organizations by projects. *International Journal of Project Management*, 28(4), 314-327. doi:10.1016/j.ijproman.2010.01.002
- Gauthier, C., & Gilomen, B. (2016). Business models for sustainability: Energy efficiency in urban districts. *Organization & Environment*, 29(1), 124-144.
- Geissdoerfer, M., Vladimirova, D., & Evans, S. (2018). Sustainable business model innovation: A review. *Journal of Cleaner Production*,

- Gilbert Silvius, A. J., Kampinga, M., Paniagua, S., & Mooi, H. (2017). *Considering sustainability in project management decision making; an investigation using Q-methodology* doi:<https://doi.org/10.1016/j.ijproman.2017.01.011>
- Gray, R., Kouhy, R., & Lavers, S. (1995). Constructing a research database of social and environmental reporting by UK companies. *Accounting, Auditing & Accountability Journal*, 8(2), 78-101.
- Hällgren, M. (2012). The construction of research questions in project management. *International Journal of Project Management*, 30(7), 804-816. doi:<http://dx.doi.org/10.1016/j.ijproman.2012.01.005>
- Halme, M., Anttonen, M., Kuisma, M., Kontoniemi, N., & Heino, E. (2007). Business models for material efficiency services: Conceptualization and application. *Ecological Economics*, 63(1), 126-137.
- Hedman, J., & Kalling, T. (2003). The business model concept: Theoretical underpinnings and empirical illustrations. *European Journal of Information Systems*, 12(1), 49-59.
- Hockerts, K., & Wüstenhagen, R. (2010). Greening goliaths versus emerging Davids—Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship. *Journal of Business Venturing*, 25(5), 481-492.

- Hope, A. J., & Moehler, R. (2014). Balancing projects with society and the environment: A project, programme and portfolio approach. *Procedia - Social and Behavioral Sciences*, 119(0), 358-367.
doi:<http://dx.doi.org/10.1016/j.sbspro.2014.03.041>
- Huemann, M., & Silviu, G. (2017). *Projects to create the future: Managing projects meets sustainable development*
doi:<https://doi.org/10.1016/j.ijproman.2017.04.014> "
- Huergo, E. (2006). The role of technological management as a source of innovation: Evidence from spanish manufacturing firms. *Research Policy*, 35(9), 1377-1388.
- Hwang, B. -, & Ng, W. J. (2013). Project management knowledge and skills for green construction: Overcoming challenges. *International Journal of Project Management*, 31(2), 272-284. doi:10.1016/j.ijproman.2012.05.004
- Ingason, H. T., & Schoper, Y. (2017). Project management and sustainability- review of the 4th IPMA research conference 2016. *Project Management Research and Practice*, 4, 5467.
- Johnson, M. P. (2015). Sustainability management and small and medium-sized enterprises: Managers' awareness and implementation of innovative tools. *Corporate Social Responsibility and Environmental Management*, 22(5), 271-285.

- Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production*, 135, 1474-1486. doi:<http://dx.doi.org/10.1016/j.jclepro.2016.06.067>
- Keeble, J. J., Topiol, S., & Berkeley, S. (2003). Using indicators to measure sustainability performance at a corporate and project level. *Journal of Business Ethics*, 44(2-3), 149-158.
- Keays, L. A., & Huemann, M. (2017). Project benefits co-creation: Shaping sustainable development benefits. *International Journal of Project Management*, 35(6), 1196-1212.
- Keays, L. A., Huemann, M., & Turner, R. (2013). Integrating project strategy for sustainable development: A conceptual framework. *Sustainable practices: Concepts, methodologies, tools, and applications* (pp. 201-220) doi:10.4018/978-1-4666-4852-4.ch011
- Kim, Y. (2013). Environmental, sustainable behaviors and innovation of firms during the financial crisis. *Business Strategy and the Environment*, doi:10.1002/bse.1811
- Kiron, D., Kruschwitz, N., Haanaes, K., Reeves, M., Goh, E., Diepenhorst, C., . . . Mangelsdorf, M. E. (2013). The innovation bottom line. *MIT Sloan Management Review Research Report Winter*,

- Kiron, D., Kruschwitz, N., Reeves, M., & Goh, E. (2013). The benefits of sustainability-driven innovation. *MIT Sloan Management Review*, 54(2), 69-73.
- Klewitz, J., & Hansen, E. G. (2014). Sustainability-oriented innovation of SMEs: A systematic review. *Journal of Cleaner Production*, 65, 57-75.
- Knoepfel, H. (2010). Survival and sustainability as challenges for projects. *International Project Management Association, Zurich*.
- Kohl, K. (2016). *Becoming a sustainable organization: A project and portfolio management approach* CRC Press.
- Krippendorff, K. (2004). *Content analysis: An introduction to its methodology* Sage.
- Kujala, S., Artto, K., Aaltonen, P., & Turkulainen, V. (2010). Business models in project-based firms - towards a typology of solution-specific business models. *International Journal of Project Management*, 28(2), 96-106.
doi:10.1016/j.ijproman.2009.08.008
- Kujala, S., Kujala, J., Turkulainen, V., Artto, K., Aaltonen, P., & Wikström, K. (2011). Factors influencing the choice of solution-specific business models. *International Journal of Project Management*, 29(8), 960-970.
doi:10.1016/j.ijproman.2011.01.009

- Kwak, Y. H., & Anbari, F. T. (2009). Analyzing project management research: Perspectives from top management journals. *International Journal of Project Management*, 27(5), 435-446.
- Labuschagne, C., & Brent, A. C. (2008). An industry perspective of the completeness and relevance of a social assessment framework for project and technology management in the manufacturing sector. *Journal of Cleaner Production*, 16(3), 253-262.
- Labuschagne, C., Brent, A. C., & Van Erck, R. P. (2005). Assessing the sustainability performances of industries. *Journal of Cleaner Production*, 13(4), 373-385.
- Labuschagne, C., & Brent, A. C. (2005). Sustainable project life cycle management: The need to integrate life cycles in the manufacturing sector. *International Journal of Project Management*, 23(2), 159-168.
doi:10.1016/j.ijproman.2004.06.003
- Labuschagne, C., Brent, A. C., & van Erck, R. P. G. (2005). Assessing the sustainability performances of industries. *Journal of Cleaner Production*, 13(4), 373-385. doi:http://dx.doi.org/10.1016/j.jclepro.2003.10.007
- Lee, K., Go, D., Park, I., & Yoon, B. (2017). Exploring suitable technology for small and medium-sized enterprises (SMEs) based on a hidden markov

model using patent information and value chain analysis. *Sustainability*, 9(7), 1100.

Lee, S., Cho, C., Choi, J., & Yoon, B. (2017). R&D project selection incorporating customer-perceived value and technology potential: The case of the automobile industry. *Sustainability*, 9(10), 1918.

Legendre, S., & Coderre, F. (2013). Determinants of GRI G3 application levels: The case of the fortune global 500. *Corporate Social Responsibility and Environmental Management*, 20(3), 182-192.

Legendre, S., & Coderre, F. (2013). Determinants of GRI G3 application levels: The case of the fortune global 500. *Corporate Social Responsibility and Environmental Management*, 20(3), 182-192. doi:10.1002/csr.1285

Lenferink, S., Tillema, T., & Arts, J. (2013). *Towards sustainable infrastructure development through integrated contracts: Experiences with inclusiveness in dutch infrastructure projects* doi:<https://doi.org/10.1016/j.ijproman.2012.09.014>

Lewandowski, M. (2016). Designing the business models for circular economy-towards the conceptual framework. *Sustainability (Switzerland)*, 8(1), 1-28. doi:10.3390/su8010043

- Lock, I., & Seele, P. (2016). The credibility of CSR (corporate social responsibility) reports in Europe. Evidence from a quantitative content analysis in 11 countries. *Journal of Cleaner Production*, 122, 186-200.
- Loosemore, M. (2016). Social procurement in UK construction projects. *International Journal of Project Management*, 34(2), 133-144.
doi:10.1016/j.ijproman.2015.10.005
- Lourenço, I. C., & Branco, M. C. (2013). Determinants of corporate sustainability performance in emerging markets: The Brazilian case. *Journal of Cleaner Production*, 57(0), 134-141. doi:<http://dx.doi.org/10.1016/j.jclepro.2013.06.013>
- Lozano, R. (2018). Sustainable business models: Providing a more holistic perspective. *Business Strategy and the Environment*, doi:10.1002/bse.2059
- Lozano, R. (2012). *Towards better embedding sustainability into companies' systems: An analysis of voluntary corporate initiatives*
doi:<https://doi.org/10.1016/j.jclepro.2011.11.060>
- Lüdeke-Freund, F., & Dembek, K. (2017). Sustainable business model research and practice: Emerging field or passing fancy? *Journal of Cleaner Production*, 168, 1668-1678.
- Magretta, J. (2002). Why business models matter. *Harvard Business Review*, 80(5), 86-87.

- Maltz, E., Bi, H. H., & Bateman, M. (2016). Benchmarking sustainability performance: The next step in building sustainable business models. *Journal of Public Affairs*, doi:10.1002/pa.1606
- Maltzman, R., & Shirley, D. (2012). *Green project management* CRC Press.
- Marcelino-Sádaba, S., González-Jaen, L. F., & Pérez-Ezcurdia, A. (2015). *Using project management as a way to sustainability. from a comprehensive review to a framework definition* doi:<https://doi.org/10.1016/j.jclepro.2015.03.020>
- Martens, M. L., & Carvalho, M. M. (2016). Key factors of sustainability in project management context: A survey exploring the project managers' perspective. *International Journal of Project Management*,
- Martens, M. L., & de Carvalho, M. M. (2014). A conceptual framework of sustainability in project management. Paper presented at the
- Martens, M. L., & Carvalho, M. M. (2017). Key factors of sustainability in project management context: A survey exploring the project managers' perspective. *International Journal of Project Management*, 35(6), 1084-1102. doi:10.1016/j.ijproman.2016.04.004
- Martínez-León, L., Otegi-Olaso, J. R., & Briongos-Vázquez, N. (2016). Mixed methods use in sustainable project management research. Paper presented

at the *Proceedings of the Dortmund International Research Conference 2016*,
Dortmund.

Martinsuo, M., & Killen, C. P. (2014). Value management in project portfolios:
Identifying and assessing strategic value. *Project Management Journal*, 45(5),
56-70.

Mathur, V. N., Price, A. D. F., & Austin, S. (2008). Conceptualizing stakeholder
engagement in the context of sustainability and its assessment. *Construction
Management and Economics*, 26(6), 601-609. doi:10.1080/01446190802061233

Mayring, P. (2014). Qualitative content analysis: Theoretical foundation, basic
procedures and software solution.

Meech, J. A., McPhie, M., Clausen, K., Simpson, Y., Lang, B., Campbell, E., . . .
Condon, P. (2006). Transformation of a derelict mine site into a sustainable
community: The britannia project. *Journal of Cleaner Production*, 14(3-4), 349-
365.

Mitsubishi Corporation. (2012). Creating sustainable corporate value. annual
report 2012. Retrieved from
<http://www.mitsubishicorp.com/jp/en/ir/ar/2012/sustainability/csr/>

- Morris, M., Schindehutte, M., & Allen, J. (2005). The entrepreneur's business model: Toward a unified perspective. *Journal of Business Research*, 58(6), 726-735.
- Morris, P. W. (November, 2017). *Climate change and what the project management profession should be doing about it*
- Mutka, S., & Aaltonen, P. (2013). *The impact of a delivery project's business model in a project-based firm* doi:<https://doi.org/10.1016/j.ijproman.2012.07.006>
- Nelson, K. (2004). How small firms innovate sustainably. *Business*, 26(6), 24-26.
- Neuendorf, K. A. (2016). *The content analysis guidebook* Sage.
- Nidumolu, R., Prahalad, C. K., & Rangaswami, M. (2009). Why sustainability is now the key driver of innovation. *Harvard Business Review*, 87(9), 56-64.
- Økland, A. (2015). Gap analysis for incorporating sustainability in project management. *Procedia Computer Science*, 64, 103-109.
doi:<http://dx.doi.org/10.1016/j.procs.2015.08.469>
- Osterwalder, A. (2004). The business model ontology: A proposition in a design science approach.
- Osterwalder, A., & Pigneur, Y. (2010). *Business model generation*. Honoken, New Jersey: John Wiley & Sons, Inc.

- Otegi-Olaso, J. R., Aguilar-Fernandez, M. E., Fuentes-Ardeo, L., & Cruz-Villazon, C. (2016). (2016). Towards sustainable project management. A literature review. Paper presented at the *19th International Congress on Project Management and Engineering*, Granada.
- Pasian, B., & Silvius, A. G. (2016). A review of project management research in IRNOP and PMI conferences from 2009 to 2014 to identify emerging perspectives. *European Academy of Management (EURAM), Paris*.
- Pearson, J. (2006). Design and sustainability: Opportunities for systemic transformation. *GreenBlue (with the Support of the Summit Foundation)*, , 1-74. Retrieved from [http://www.greenblue.org/PDFs/PEARSON% 20Design% 20 % 20Sustainability.pdf](http://www.greenblue.org/PDFs/PEARSON%20Design%20%20Sustainability.pdf)
- Peenstra, R., & Silvius, G. (2017). Enablers for considering sustainability in projects; the perspective of the supplier. Paper presented at the *Procedia Computer Science*, , 121 55-62. doi:10.1016/j.procs.2017.11.009
- Perecman, E., & Curran, S. R. (2006). *A handbook for social science field research: Essays & bibliographic sources on research design and methods: Essays & bibliographic sources on research design and methods* Sage Publications.

Peric, M., Durkin, J., & Vitezic, V. (2017). The constructs of a business model redefined: A half-century journey. *SAGE Open*, 7(3), 2158244017733516.

Piggot-Irvine, E. (2009). *Action research in practice*. ERIC.

Prendeville, S. M., O'Connor, F., Bocken, N. M. P., & Bakker, C. (2017).

Uncovering ecodesign dilemmas: A path to business model innovation

doi:<https://doi.org/10.1016/j.jclepro.2016.11.095>

Rauter, R., Jonker, J., & Baumgartner, R. J. (2017). Going one's own way: Drivers

in developing business models for sustainability. *Journal of Cleaner*

Production, 140, Part 1, 144-154.

doi:<http://dx.doi.org/10.1016/j.jclepro.2015.04.104>

Reginato, J. M. (2009). Evaluating project robustness through the lens of the

business model. *International Journal of Innovation and Technology*

Management, 6(02), 155-167.

Rybicka, J., Tiwari, A., & Leeke, G. A. (2016). Technology readiness level

assessment of composites recycling technologies. *Journal of Cleaner*

Production, 112, 1001-1012. doi:10.1016/j.jclepro.2015.08.104

Sandberg, J., & Alvesson, M. (2011). Ways of constructing research questions:

Gap-spotting or problematization? *Organization*, 18(1), 23-44.

Santolaria, M., Oliver-Solà, J., Gasol, C. M., Morales-Pinzón, T., & Rieradevall, J.

(2011). Eco-design in innovation driven companies: Perception, predictions and the main drivers of integration. the spanish example. *Journal of Cleaner Production*, 19(12), 1315-1323.

doi:<http://dx.doi.org/10.1016/j.jclepro.2011.03.009>

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business*

Students (Harlow, England: Pearson Education),

Scarpellini, S., Valero-Gil, J., & Portillo-Tarragona, P. (2016). The “economic–finance interface” for eco-innovation projects. *International Journal of Project Management*, 34(6), 1012-1025.

Schadewitz, H., & Niskala, M. (2010). Communication via responsibility

reporting and its effect on firm value in finland. *Corporate Social*

Responsibility and Environmental Management, 17(2), 96-106.

doi:10.1002/csr.234

Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2012). Business cases for

sustainability: The role of business model innovation for corporate

sustainability. *International Journal of Innovation and Sustainable Development*,

6(2), 95-119. doi:10.1504/IJISD.2012.046944

Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2016). Business models for sustainability: A co-evolutionary analysis of sustainable entrepreneurship, innovation, and transformation. *Organization and Environment*, 29(3), 264-289. doi:10.1177/1086026616633272

Schieg, M. (2009). The model of corporate social responsibility in project management. *Verslas: Teorija Ir Praktika*, (4), 315-321.

Schoormann, T., Behrens, D., Kolek, E., & Knackstedt, R. (2016). Sustainability in business models - A literature-review-based design-science-oriented research agenda. Paper presented at the 24th European Conference on Information Systems, ECIS 2016,

Seele, P. (2017). Predictive sustainability control: A review assessing the potential to transfer big data driven 'predictive policing' to corporate sustainability management. *Journal of Cleaner Production*, 153, 673-686. doi:10.1016/j.jclepro.2016.10.175

Silvius, G. (2012). Change the game: Sustainability in projects and project management. *Green business process management* (pp. 161-177) Springer.

Silvius, G., & Schipper, R. (2017a). Four strategic postures for sustainability in the project-based organization. *Green Production Strategies for Sustainability*, , 259.

Silvius, G. (2012c). Analysis of the coverage of sustainability aspects in the pmbok. Retrieved from <http://www.slideshare.net/GilbertSilvius/analysis-of-the-coverage-of-sustainability-aspects-in-the-pmbok>

Silvius, G. (2012d). *Sustainability in project management*. Surrey: Gower.

Silvius, G. (2017). *Sustainability as a new school of thought in project management*
doi:<https://doi.org/10.1016/j.jclepro.2017.08.121>

Silvius, G., & Tharp, J. (2013). *Sustainability integration for effective project management* IGI Global. doi:10.4018/978-1-4666-4177-8 Retrieved from <http://services.igi-global.com/resolvedoi/resolve.aspx?doi=10.4018/978-1-4666-4177-8>

Smyth, H. J., & Morris, P. W. (2007). An epistemological evaluation of research into projects and their management: Methodological issues. *International Journal of Project Management*, 25(4), 423-436.

Smyth, H., Gustafsson, M., & Ganskau, E. (2010). The value of trust in project business. *International Journal of Project Management*, 28(2), 117-129.
doi:10.1016/j.ijproman.2009.11.007

Sommer, A. (2012). *Managing green business model transformations* Springer Science & Business Media.

- Song, Y., Feng, T., & Jiang, W. (2017). The influence of green external integration on firm performance: Does firm size matter? *Sustainability*, 9(8), 1328.
- Stubbs, W., & Cocklin, C. (2008). Conceptualizing a "sustainability business model". *Organization and Environment*, 21(2), 103-127.
doi:10.1177/1086026608318042
- Talbot, J., & Venkataraman, R. (2011). Integration of sustainability principles into project baselines using A comprehensive indicator set. *International Business & Economics Research Journal*, 10(9)
- Tam, G. (2010). The program management process with sustainability considerations. *Journal of Project, Program & Portfolio Management*, 1(1), 17-27.
- Tam, G. C. (Ed.). (2017). *Managerial strategies and green solutions for project sustainability*. China: IGI Global, Business Science Reference, 2017.
- Tashakkori, A., & Teddlie, C. (2010). *Sage handbook of mixed methods in social & behavioral research* Sage.
- The International Integrated Reporting Council (IIRC). (2013). *The international framework*. ().The International Integrated Reporting Council (IIRC).

Retrieved from <http://integratedreporting.org/resource/international-ir-framework/>

- Tinnilä, M. (2007). Palvelujen liiketoimintamallit. *Teollisuuden Palveluksista Palveluliiketoimintaan: Haasteena Kannattava Kasvu*, , 143-160.
- Tiron-Tudor, A., & Dragu, I. (2013). Project success by integrating sustainability in project management. In G. Silviu, & J. Tharp (Eds.), *Sustainability integration for effective project management* (pp. 106) IGI Global.
- Tong, M., & Thomson, C. (2015). Developing a critical literature review for project management research. *Designs, Methods and Practices for Research of Project Management*, Publisher: Gower Publishing Limited, , 153-171.
- Toppinen, A., Li, N., Tuppuru, A., & Xiong, Y. (2012). Corporate responsibility and strategic groups in the forest-based industry: Exploratory analysis based on the global reporting initiative (GRI) framework. *Corporate Social Responsibility and Environmental Management*, 19(4), 191-205.
- Triguero, Á, Cuerva, M. C., & Álvarez-Aledo, C. (2017). Environmental innovation and employment: Drivers and synergies. *Sustainability*, 9(11), 2057.

- Tsang, S., Welford, R., & Brown, M. (2009). Reporting on community investment. *Corporate Social Responsibility and Environmental Management*, 16(3), 123-136.
- Turner, R. (2010). (2010). Responsibilities for sustainable development in project and program management. Paper presented at the *IPMA International Expert Seminar. 2010: Survival and Sustainability as Challenges for Projects*, Zurich. 161. Retrieved from <https://es.scribd.com/document/106455749/Book-Survival-and-Sustainability>
- Uhlaner, L. M., Berent-Braun, M. M., Jeurissen, R. J., & de Wit, G. (2012). Beyond size: Predicting engagement in environmental management practices of dutch SMEs. *Journal of Business Ethics*, 109(4), 411-429.
- Upward, A., & Jones, P. (2016). An ontology for strongly sustainable business models: Defining an enterprise framework compatible with natural and social science. *Organization and Environment*, 29(1), 97-123.
doi:10.1177/1086026615592933
- Van Ostaeyen, J., Van Horenbeek, A., Pintelon, L., & Duflou, J. R. (2013). A refined typology of product–service systems based on functional hierarchy modeling doi:<https://doi.org/10.1016/j.jclepro.2013.01.036>

- Veit, C., Lambrechts, W., Quintens, L., & Semeijn, J. (2018). The impact of sustainable sourcing on customer perceptions: Association by guilt from scandals in local vs. offshore sourcing countries. *Sustainability, 10*(7), 2519.
- Wagner, M. (2010). The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects. *Ecological Economics, 69*(7), 1553-1560.
- Walker, H., & Preuss, L. (2008). Fostering sustainability through sourcing from small businesses: Public sector perspectives. *Journal of Cleaner Production, 16*(15), 1600-1609.
- Wang, Y., Han, Q., de Vries, B., & Zuo, J. (2016). How the public reacts to social impacts in construction projects? A structural equation modeling study. *International Journal of Project Management, 34*(8), 1433-1448.
- Wang, Y., & Liu, J. (2015). Evaluation of the excess revenue sharing ratio in PPP projects using principal-agent models. *International Journal of Project Management, 33*(6), 1317-1324.
- Weninger, C., & Huemann, M. (2013). Project initiation: Investment analysis for sustainable development. *Sustainability integration for effective project management* (pp. 144-159) doi:10.4018/978-1-4666-4177-8.ch009

- Wikström, K., Artto, K., Kujala, J., & Söderlund, J. (2010). Business models in project business. *International Journal of Project Management*, 28(8), 832-841. doi:<http://dx.doi.org/10.1016/j.ijproman.2010.07.001>
- Wikstrom, K., Hellstrom, M., Artto, K., Kujala, J., & Kujala, S. (2009). Services in project-based firms - four types of business logic. *International Journal of Project Management*, 27(2), 113-122. doi:10.1016/j.ijproman.2008.09.008
- Winter, M., Andersen, E. S., Elvin, R., & Levene, R. (2006). Focusing on business projects as an area for future research: An exploratory discussion of four different perspectives. *International Journal of Project Management*, 24(8), 699-709. doi:<http://dx.doi.org/10.1016/j.ijproman.2006.08.005>
- Xue, X., Zhang, R., Zhang, X., Yang, R. J., & Li, H. (2015). Environmental and social challenges for urban subway construction: An empirical study in china. *International Journal of Project Management*, 33(3), 576-588.
- Xue, X., Zhang, X., Wang, L., Skitmore, M., & Wang, Q. (2018). Analyzing collaborative relationships among industrialized construction technology innovation organizations: A combined SNA and SEM approach. *Journal of Cleaner Production*, 173, 265-277.

- Yang, Z., Sun, J., Zhang, Y., & Wang, Y. (2017). Green, green, it's green: A triad model of technology, culture, and innovation for corporate sustainability. *Sustainability*, 9(8), 1369.
- Yoon, B., Shin, J., & Lee, S. (2016). Open innovation projects in SMEs as an engine for sustainable growth. *Sustainability*, 8(2), 146.
- Yu, G. J., Kwon, K., Lee, J., & Jung, H. (2016). Exploration and exploitation as antecedents of environmental performance: The moderating effect of technological dynamism and firm size. *Sustainability*, 8(3), 200.
- Yu, M., Zhu, F., Yang, X., Wang, L., & Sun, X. (2018). Integrating sustainability into construction engineering projects: Perspective of sustainable project planning. *Sustainability*, 10(3), 784.
- Yun, J. J., Jung, W., & Yang, J. (2015). Knowledge strategy and business model conditions for sustainable growth of SMEs. *Journal of Science & Technology Policy Management*, 6(3), 246-262.
- Zott, C., & Amit, R. (2007). Business model design and the performance of entrepreneurial firms. *Organization Science*, 18(2), 181-199.
- Zott, C., & Amit, R. (2008). The fit between product market strategy and business model: Implications for firm performance. *Strategic Management Journal*, 29(1), 1-26.

Zuo, K., Potangaroa, R., Wilkinson, S., & Rotimi, J. O. (2009). A project management prospective in achieving a sustainable supply chain for timber procurement in banda aceh, indonesia. *International Journal of Managing Projects in Business*, 2(3), 386-400.