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Key factors of sustainability in project management context: A survey exploring the project managers' perspective

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Abstract

Topics of project management and sustainability have been addressed by countless studies, but research focusing on the intersection of these topics are needed. This research looks at sustainability through the triple-bottom line perspective: economic, social, and environmental. It aims to identify key aspects of sustainability in project management context and to understand its importance based on project managers' lens. A systematic literature review merging bibliometric and content analysis was applied toward an understanding of the key topics. Further, a survey of project managers was performed and analyzed through exploratory factor analysis. The results show that four factors stood out: Sustainable Innovation Business Model, Stakeholders Management, Economic and Competitive Advantage, and Environmental Policies and Resources Saving.

Keywords: Sustainability; Project management; Triple-bottom line; Sustainability in project management; Sustainable development

1. Introduction

Social, economic, and environmental challenges have become increasingly complex, forcing organizations to innovate, manage change, and adopt new activities (Pope et al., 2004; Wilkins, 2003). In addition of this fact, there is an increasing interest in using practices in project management (PM) and certifying professionals in this field, supported by bodies of knowledge proposed by the institute (PMI, Project Management Institute, 2013) and associations (IPMA, 2013). Project management and sustainability have been addressed by countless studies, but the intersection between these two fields is still rarefied with just a few studies that have focused on both topics. According to Gimenez et al. (2012) and Kleindorfer et al. (2005), sustainability integrates social, environmental, and economic responsibility in order to create a rational use of present resources and to offer normal life for future generations.

Some initiatives aiming to integrate these two themes are already underway (Silvius et al., 2013; Gareis et al., 2013; Martens et al., 2013; Sánchez, 2015; Silvius and Tharp, 2014; Anning, 2009; Bernhardi et al., 2000; Bodea et al., 2010; Fernández-Sánchez and Rodríguez-López, 2010; Hartig et al., 1996; Jones, 2006; Mulder and Brent, 2006; Raven et al., 2009; Turlea et al., 2010; Vifell and Soneryd, 2012), but much additional research is needed to develop tools, techniques and methodologies (El-Haram et al., 2007; Singh et al., 2012; Thomson et al., 2011) that can be applied in project management to assess sustainability at the project or organization level (Carvalho and Rabechini, 2011; Cole, 2005; Deakin et al., 2002; Thomson et al., 2011).

The need for studies on the converging themes of sustainability and project management, coupled with the growing importance of

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both topics in the current business context, drove the development of this study, which aims to contribute to a better understanding of the theme of sustainability in project management. Accordingly, this study aims to fulfill this gap by identifying the key aspects of sustainability in project management context and understand the importance based on project managers lens. The research design applies multi-method approach, combining a systematic literature review and survey-based research.

The main contribution leads to approaching sustainability in project management context and defining the key factors, based on the project managers' perspective, which are Sustainable Innovation Business Model, Stakeholders Management, Economic and Competitive Advantage, and Environmental Policies and Resources Saving.

This paper is structured in six sections. Following this introduction, Section 2 presents the literature review. In Section 3, the research design is explained. The results are presented in Section 4, followed by the discussion in Section 5. Finally, Section 6 presents the final considerations.

2. Literature review

2.1. Sustainability, sustainable development, and corporate social responsibility

Several international events can be highlighted in the context of the development of standards and mean ideas for the sustainable development (SD). For example, the United Nations Conference on Environment and Development took place the well-known Rio 92, in Brazil in 1992 (which developed the creation of a letter with 27 principles that could offer help and actions for partners and countries); the formulation and sign of the Kyoto Protocol in 1997; the conference called Rio + 10 in Rio de Janeiro again; as well as the Bellagio Principles (Hardi and Zdan, 1997), had been a paramount contribution, among others events. Recently, in July of 2012, again in Rio de Janeiro, chairmen of countries and States (called the ONU system) and the civil society participated of the Rio + 20 that discussed three main topics: the green economy in the SD context, the eradication of the poverty, and the institutional structure for the SD. This event developed a publication of an official report named "The future we want" confirming the commitment between countries to reach the SD (Rio+20, 2013).

A broader accepted concept of SD is the one given by the World Commission for the Environment and Development, and it is important in order to understand and to formulate the concept of sustainability. According to the report named "Our Common Future," SD is defined as the development that meets the needs of the actual generations without compromising the needs of future one (WCED, World Comission on Environment and Development, 1987). A concept of SD more acceptable is the one based on the integration of economic, environmental, and social dimensions, designing the sustainability known as Triple-Bottom-Line (TBL), and it became widely known (Elkington, 1998; Knoepfel, 2010; Labuschagne et al., 2005; Carvalho and Rabechini, 2011; Gimenez et al., 2012; Talbot and Venkataraman, 2011). In this way, DS is synonymous of rational society with clean businesses and consequently with economic development (Araújo and Mendonça, 2009). In 2001, the United Nations Commission on Sustainable Development (UNCSD) develops a guidelines and methodologies showing indicators of SD (UNCSD, United Nations Commission on Sustainable Development, 2001). Furthermore, the World Business Council for Sustainable Development (WBCSD, The World Business Council for Sustainable Development, 2006) shows a diagram where SD is similar to Corporate Responsibility (CR) and they are divided in corporate financial responsibility, corporate environmental responsibility, and corporate social responsibility.

According to Araújo and Mendonça (2009), the concepts of SD and sustainability are distinct: SD is commonly associated with the expectation of a country entering in a growth phase and remain so over time, and sustainability is the ability to self-sustaining itself and self-remaining. Thus, we can relate SD with public policies and sustainability with all other actions promoted by the private sector. Furthermore, it can be designed the concept of corporate sustainability (CS), related to actions aimed at the business environment, which is also presented by Baumgartner and Ebner (2010, p.77) when they argue that "sustainable development when incorporated by the organization is called corporate sustainability (CS) and it contains like sustainable development, all three pillars: economic, ecological and social."

In addition to this differentiation, the topic of Corporate Social Responsibility (CSR), used in several studies in scattered directions, deserves to be highlighted and differentiated. As a concept, CSR can be defined as "Corporate social responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large" (WBCSD, The World Business Council for Sustainable Development, 2006, p.3). On the other hand, the Commission of European Communities describes CSR as a concept, whereby companies integrate social and environmental concerns into their business operations and interactions with their stakeholders on a voluntary basis (Commission of the European Communities, 2001).

The study given by Ebner and Baumgartner (2006) as well as Baumgartner and Ebner (2010) brings a model that provides the topics of SD and CSR properly. To develop the model, these authors reviewed 43 articles and defined 5 major clusters: cluster 1 based SD on the concept of WCED or on the triple-bottom line, cluster 2 is based on CSR in the stakeholders approach, cluster 3 based on CSR in the SD, cluster 4 is based on SD and CSR as interchangeably, and cluster 5 consisted of items that blend the concepts and do not fit in the first 4 clusters. Thus, these authors define their model compounded of SD in the external environment or macro level, in the environment of CS or micro level, and present the economic, environmental, and social dimensions incorporated, but also being influenced by other factors as legal, technological, market, environmental, cultural, and society. The detail of this model is that the authors insert the CSR in the social dimension of sustainability.

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Sustainability is defined by Gladwin et al. (1995) as a process that creates a vision of community that respects the prudent use of the natural resources to ensure that the present generations achieve a high degree of economic security and can attain democracy and popular participation in the control of their communities while maintaining the integrity of the ecological systems and of life. For Gimenez et al. (2012) and Kleindorfer et al. (2005), the term of sustainability is used to include environmental management, the closed-loop supply chains and a broad perspective on the triple-bottom line, thought that is part of the profit, people, and the planet in corporate culture, strategy, and operations.

For the organizations, this macroeconomic setting, the definition of sustainability adopted and used by the WCED, World Commission on Environment and Development (1987), is difficult to apply and provides little guidance on how the current needs should be identified in relation to the future, on how to determine the technologies and resources to meet these needs and understand how to effectively balance organizational responsibilities among multiple stakeholders (Hart, 1995; Starik and Rands, 1995; Gimenez et al., 2012).

It is recognized that the broad definition of the WCED integrates economic, environmental, and social issues. The way as the definition is usually operationalized is through the triple-bottom line, a concept developed by Elkington (1998). Economic sustainability is generally well understood and has been operationalized at the operational level, as the costs of producing or manufacturing (Cruz and Wakolbinger, 2008; Gimenez et al., 2012). However, the definition of environmental and social sustainability is sometimes not so clear. At the operational level, environmental sustainability refers to the use of energy and other resources and waste left behind as a result of its operations. Environmental sustainability is often related to waste reduction, pollution reduction, energy efficiency, emissions reduction, reduced consumption of hazardous, harmful and toxic materials, and the decrease in the frequency of environmental accidents (Gimenez et al., 2012).

On the other hand, social sustainability has focused on internal communities (employees) and external (Pullman et al., 2009). Social sustainability means that organizations provide equal opportunities, encourage diversity, promote connectivity within and outside the community, ensure the quality of life, and provide democratic processes and responsible governance structures (Elkington, 1998). In fact, companies need to engage in CSR activities as a way to improve their social reputation (Fombrun, 2005; Gimenez et al., 2012). The triple-bottom-line concept suggests that organizations do not only engage in social behavior and environmentally responsible, but also, that the positive financial gains can be obtained in the process.

Moreover, organizations can incorporate principles of sustainability into their activities in the following ways (Labuschagne et al., 2005): by considering sustainability during the preparation and review of business strategies, by supporting new agreements and negotiations that promote sustainable practices, and by developing new projects driven by sustainability principles and finally, by broadening their vision of sustainability beyond the limits of the company.

Sustainability as TBL was a phrase coined in 1994 by John Elkington with the aim of broadening the environmentalist agenda of those working in the field of sustainability so that the concept of sustainability could be more explicitly incorporated the social dimension (Elkington, 2004). He used this phrase as a basis for his book "*Cannibals With Forks*," in which he explains that the TBL vision comprises three components: economic prosperity, environmental quality, and social justice (Elkington, 1998). For the author, it is the dimension of social justice that completes the TBL, and this dimension is the element of sustainability that many companies still partially ignore. Sustainability is envisioned as a TBL, which Elkington refers to as "triple-P": planet, profit, and people. The idea is that the three pillars of sustainability are not stable but, rather, are in a constant flow of movement due to social, political, economic, and environmental pressures, and its effects occur at the interface of the pillars (Elkington, 2012).

In reference to these interface effects involves challenges such as eco-efficiency, environmental obligations and shareholder values, economic and environmental accounting, ecological tax reform, and reflective prices (Elkington, 2012). At the economic and social interface, there are the questions of social impacts from proposed investments, business ethics, fair trade, human rights and minorities' issues and the capitalism of stakeholders.

According to Savitz (2006), the TBL view captures the essence of sustainability by measuring the impact of organizational activities across the world. Based on this perspective, sustainability is not simply a management tool for organizations. In addition, for organizations to continue to operate in the long term, they must take measures to ensure that they contribute to the sustainable management of natural and human resources and contribute to the well-being of society and the economy as a whole (Mitchell et al., 2007).

In this study, we intend to propose an approach that considers the sustainability in the TBL perspective. In project management field, this perspective is rare. Most of the research on sustainability in project management has an unbalanced view considering the TBL (Anning, 2009; Bernhardi et al., 2000; Bodea et al., 2010; Brones et al., 2014; Brones and Carvalho, 2015; Carvalho and Rabechini, 2011; Fernández-Sánchez and Rodríguez-López, 2010; Gareis et al., 2013, Hartig et al., 1996; Jones, 2006; Sánchez, 2015; Mulder and Brent, 2006; Raven et al., 2009; Silvius et al., 2013; Silvius and Tharp, 2014; Turlea et al., 2010; Vifell and Soneryd, 2012). In consequence, Carvalho and Rabechini (2011) argue the need for the environmental, social, and economic dimensions of sustainability to be incorporated into project management. According to Silvius et al. (2013), the relationship between project management and sustainable development has been gaining attention among professionals and scholars.

2.2. Sustainability in project management

This section explores in the sample studied, the main concepts about sustainability in project management, as well as the gaps related to the intersection between both topics. In addition, is

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discussed the literature view remaining to the integration of sustainability in project management.

The sustainability is increasingly perceived as necessary for understanding the social, economic, and environmental consequences associated with the way projects and their support systems are designed, constructed, operated, maintained, and eventually eliminated (El-Haram et al., 2007; Thomson et al., 2011). However, the lack of a common structure and language for analyzing and assessing sustainability means the lack of a method that is useful and applicable to projects (Cole, 2005; Deakin et al., 2002; Thomson et al., 2011).

Despite this fact, Pope et al. (2004) and Wilkins (2003) argue that the evaluation of sustainability has a fundamental role in the creation of an environment where interested parties (stakeholders) are forced to rethink their priorities through the analysis of the potential impact of their projects on sustainability. Sustainability assessments require tangible information about the main aspects of sustainability in projects, thereby providing guidance during the decision-making process in a manner that is transparent and inclusive of all involved parties (Mathur et al., 2008; El-Haram et al., 2007; Thomson et al., 2011).

The implementation and measurement of sustainability principles remain in the early stages and many technical and conceptual issues have not yet been addressed (Singh et al., 2012; El-Haram et al., 2007; Thomson et al., 2011). Tools and practices to support decision making are necessary for systematically including sustainability criteria in project evaluation, production, and processes and in project selection. In addition, the development of greening tools, which have objectives such as pollution reduction or continuous improvement, must be transformed into sustainability tools that focus on final objectives or outcomes, such as ensuring health and ecosystem integrity (Gladwin et al., 1995).

According to Bebbington et al. (2007) and Singh et al. (2012), there is a widely recognized need for people, organizations, and companies to obtain models, metrics, and tools to define and quantify sustainability through systematic forms and procedures. In addition, to achieve progress in sustainability, the development of sustainability indicators must be systematically monitored, measured, quantified, and interpreted (Hardi and Zdan, 1997). These authors show the called “Bellagio Principles” that serve as guidelines for the whole of the assessment process including the choice and design of indicators, their interpretation, and communication of the result. These principles are interrelated and should be applied as a complete set. They are intended for use in starting and improving assessment activities of community groups, non-government organizations, corporations, national governments, and international institutions (Hardi and Zdan, 1997). Although much research has been carried out in the area of sustainability metrics, and there is still ample room for additional research in the domain of sustainability because the sustainability field is diverse and complex, especially with regards to certain countries or organizations (Welsch, 2005; Singh et al., 2012).

Similarly, according to Labuschagne et al. (2005), there is a lack of systems in place for measuring performance toward sustainability in operational practices. According to these authors, sustainability has typically been thought of mostly in institutional and strategic terms, without giving appropriate consideration to the economic-operational side of manufacturing activities. Few indicators have been applied to measure the efficiency of operations, and existing indicators are too focused on the environmental side and are fundamentally oriented toward product development. Brent (2005); Brent and Petrick (2007) and Heuberger et al. (2007) explore the environmental impact assessment, considering issues related to the Kyoto protocol and product life cycles.

The motivations that drive companies to develop sustainable projects are not solely based on solidarity. Studies have demonstrated that the benefits of sustainability are not just confined to environmental and social benefits. Sustainability also enhances the value of organizations (Fiksel et al., 1999). In addition, in the modern era, it is impossible to think about economic development without the parallel construct of protecting the environment and the mutual benefits to society. According to Schwarz et al. (2002), a central premise of sustainability is that economic well-being is inextricably linked to conservation of the environment and the well-being of the human population. Thus, there is demand for a business management model that makes the connection between value creation with ecological and social compatibility and unites these two ideas in a balanced equilibrium (VDI, Verein Deutscher Ingenieure, 2006; Al-Saleh and Taleb, 2010).

In this context, Porter and Linde (1995) showed that the most competitive companies are those that best utilize their resources. The most competitive organizations are not those that utilize lower-cost resources but those who employ the most advanced technologies and the best methods for controlling their resources. Sánchez (2015) corroborates with this perspective and purposes a framework to help organizations to allocate resources to the right projects to attain its business strategy and stakeholders demand.

Sustainability was adopted by many companies through their mission statement and strategy. However, social and environmental dimensions of sustainability are difficult to incorporate in programs and projects. According to Sánchez (2015), the proposal addresses both the portfolio selection problem and the project tracking phase. The portfolio selection allows selecting the better mix of projects based on the simultaneous analysis of eco-impacts and contribution to organizational goals. Once a portfolio is selected, monitoring aims to control project realization and decide on adjustments arisen from deviations from initial estimations. Both selection and monitoring are modeled as an optimization problem. The authors believe that this conceptual framework has a good potential for integrating sustainability and project management in operational terms.

Remarkably, some companies have taken the initiative to identify opportunities to capture value through the concept of sustainability (McMullen, 2001). Organizations are increasingly aware that the choices they make about products and processes can have profound environmental and social implications (Sarkis et al., 2012). Within this evolutionary context, decision makers within private companies have been burdened with a multitude of pressures from interested parties, including pressures from environmental agencies and the social conscience of workers,

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consumers, and communities. These pressures must be weighed alongside the need to provide a guarantee of a reasonable return on investment and the long-term viability of the company to company shareholders.

At the organizational level, corporate social responsibility helps to improve ecological and economic performance. At this level, a tri-dimensional vision (economic, environmental, and social) becomes increasingly feasible and necessary. Some studies have shown that socially responsible organizations also take action, at least in the short term (CIEC, Chemical Industry Education Center, 2005; Pearce, 2003; Rics, 2004). Furthermore, it is expected that these organizations will continue to be socially healthy in the long term. Labuschagne and Brent (2003, 2005, 2006, 2007, 2008) explore criteria that must be considered in sustainability evaluation framework, considering environmental aspects related to project life cycle management and also social indicators.

Thus, it is important that the three metrics of the triple-bottom line are put into a framework of constructs, factors, or variables that can be used as a decision model by organizations that wish to improve sustainability. The principles of environmental economics and associated processes have been well established, and environmental actions have been seen to substantial growth (Chau et al., 2007; Chen et al., 2005; Matar et al., 2008). Well-established standards, such as Leadership in Energy and Environmental Design (LEED) requirements (GBCB, 2013) and British Building Research Establishment Environmental Assessment Method (BREEAM) (Bocchini et al., 2014), are well known in the building industry. Actually, the most part of publications of applications of sustainable principles in project management were found in the construction projects (Robichaud and Anantatmula, 2011; Shen et al., 2007; Valdes-Vasquez and Klotz, 2013).

However, the implications of implementing a social sustainability perspective have rarely been discussed. Valdes-Vasquez and Klotz (2013) argue that a truly sustainable construction project, for example, must include social considerations about the end users, as well as considerations of the impacts of the project in the community with regards to the safety, health, and education of people involved. Integration of all of these considerations would improve the performance of long-term projects and the quality of life of people affected by those projects. Schieg (2009) also highlight both internal and external dimension of social responsibility to build the model of corporate social responsibility in project management.

With regards to these challenges of identifying appropriate sustainability metrics and introducing them in project management, Bebbington et al. (2007), cited by Singh et al. (2012), reinforce the importance of including sustainability variables in planning, monitoring, evaluation, and decision making to facilitate collaboration and improve the quality of projects.

Carvalho and Rabechini (2011) propose an assessment model with 35 questions based on three axes of analysis: (i) project management processes focusing on sustainability, (ii) people and systems, and (iii) clean technologies. They argue that sustainability in project management can be exploited in several ways, such as making sustainable purchases, developing an analytical structure of projects, using life cycle analysis, performing risk management of enterprises, and considering sustainability elements in the project solution (Carvalho and Rabechini, 2011).

It is important to say that simultaneously with the discussion about sustainability, new studies are being developed about the concept of resilience. Bocchini et al. (2014) developed a first initiative of model in order to align both concepts. In their work, they highlighted similarities and differences, where sustainability is related to the concept given by WCED, and according to Timmerman, cited by Bocchini et al. (2014, p.7), "resilience is the ability of human communities to withstand external shocks or perturbations to their infrastructure and to recover from such perturbations." The analysis of resilience did not take into account in the current research described along this paper.

Therefore, the opportunities for new contributions and the knowledge exposed in this section demonstrate the importance of incorporating the theme of sustainability into project management, and more specifically, the importance of identifying sustainability constructs or variables that can be used in project management and showing the real importance in the applied context.

2.3. Approaching sustainability and project management

The need to work toward sustainability by introducing the three dimensions of sustainability (environmental, social, and economic) into project management is clear, as discussed in the previous section. Based on this line of reasoning, studies that promote the integration of the concepts of sustainability into project management were selected and deployed in key variables and summarized in Tables 1, 2, and 3.

Twenty-four scholar studies of sustainability in PM considering the TBL were analyzed. The key variables were coded and clustered in a set of variables aligned with the three dimensions of triple bottom line. These 24 studies were spread across different industries and professional fields, such as engineering and management. The variables were first grouped and code in the three pillars of TBL and after identifying various sustainability variables per pillar using affinity diagrams. These codes were applied in the surveyed publications, using a computer-aided approach performed by the Sphinx software (Freitas and Janissek, 2000), which helped to manage the frequencies accounts related to the codes. The code tree was composed of 158 raw codes in the economic dimension, 248 in the environmental dimension, and 270 in the social dimension of sustainability. Pareto's concept was used to identify the key variables and affinity diagram was applied to group and summarize the codes.

Tables 1–3 show the cross-models analysis and the key variables detected. Table 1 shows the summary of the 13 affinity code groups for economic sustainability and their relation to the selected models.

In the environmental dimension of sustainability, the 248 raw codes were grouped in 11 affinity code groups. The majority of the models in the literature considered air, water, energy, soil, waste generation, and the consumption of materials as fundamental items for environmental sustainability in project management.

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Table 1
Main variables of economic sustainability extracted from the cross-model analysis.

Code	Variables	Araújo (2010)	Azapagic (2004)	Buson et al. (2009)	Carvalho and Rabechini (2011)	DJSI (2013)	Elkington (2012)	ETHOS (2012)	Fellows and Liu (2008)	Fernández-Sánchez and Rodríguez-López (2010)	Fiksel et al. (1999)	GRI (2013)	ICHEME (2002)	Labuschagne et al. (2005)
ES_1	Financial performance (return on investments, solvency, profitability, and liquidity)	1	1	1	1	0	1	0	1	0	0	1	1	1
ES_2	Financial benefits of good practices (social, environmental, health and safety, job creation, education, and training)	0	0	0	1	0	1	0	1	1	1	1	1	1
ES_3	Business ethics (fair trade, relationship with competition and anti-crime policies, codes of conduct, bribery and corruption, technical and legal requirements, tax payments)	0	0	0	0	1	1	1	0	1	0	1	1	0
ES_4	Cost management (resources)	1	1	1	1	0	0	0	1	1	1	0	0	0
ES_5	Management of the company's relationship with customers (marketing and brand management, market share, management opportunities, risk management, and pricing)	0	0	0	1	1	0	1	0	0	1	1	0	1
ES_6	Participation and involvement of stakeholders (corporate governance)	0	0	1	0	1	0	1	0	0	1	1	0	0
ES_7	Innovation management (research and development, consumption patterns, production, productivity, and flexibility)	1	0	0	0	1	0	0	0	0	1	0	0	0
ES_8	Economic performance (profit sharing, GDP)	0	1	0	0	0	0	0	1	0	0	0	0	1
ES_9	Culture of the organization and its management (heritage)	0	0	0	0	0	0	1	0	1	0	0	0	0
ES_{10}	Economics and environmental accounting	0	0	0	0	0	1	0	0	0	0	0	0	0
ES_{11}	Management of intangibles	0	0	0	0	0	0	0	0	0	1	0	0	0
ES_{12}	Internationalization	0	0	0	0	0	0	0	0	0	0	0	0	0
ES_{13}	Investments and improvements in services and installations	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	3	3	3	4	4	4	4	4	4	6	5	3	4

Note: The results of the correlations mean that the model in vertical line (1) presents the variable and (0) does not present the variable. The total account in each column shows the variables cited in each model. The total account in each line represents how many surveyed models consider the same variable.

Table 1 (*continued*)

Code	Variables	Liu et al. (2013)	Mulder and Brent (2006)	Pulaski and Horman (2005)	Sarkis et al. (2012)	Savitz (2006)	Silvius et al. (2013)	Spangenberg and Bonniot (1998)	UNCSD (2001)	VDI 4070 (2006)	Veleva and Ellenbecker (2001)	Xing et al. (2009)	Total	%
ES_1	Financial performance (return on investments, solvency, profitability, and liquidity)	1	1	0	1	1	1	0	1	1	0	1	17	20%
ES_2	Financial benefits of good practices (social, environmental, health and safety, job creation, education, and training)	0	1	0	0	1	0	0	0	1	1	1	13	16%
ES_3	Business ethics (fair trade, relationship with competition and anti-crime policies, codes of conduct, bribery and corruption, technical and legal requirements, tax payments)	0	0	0	0	1	0	0	0	0	1	0	8	10%
ES_4	Cost management (resources)	1	0	1	1	0	0	0	0	1	0	1	12	14%
ES_5	Management of the company's relationship with customers (marketing and brand management, market share, management opportunities, risk management, and pricing)	0	0	0	0	0	0	0	0	1	1	0	8	10%
ES_6	Participation and involvement of stakeholders (corporate governance)	0	1	0	0	0	0	1	0	0	1	0	8	10%
ES_7	Innovation management (research and development, consumption patterns, production, productivity, and flexibility)	0	0	1	0	0	1	0	1	1	0	0	7	8%
ES_8	Economic performance (profit sharing, GDP)	0	0	0	0	0	0	0	0	0	0	0	3	4%
ES_9	Culture of the organization and its management (heritage)	0	1	0	0	0	0	0	0	0	0	0	3	4%
ES_{10}	Economics and environmental accounting	0	0	0	0	0	0	0	0	0	0	0	1	1%
ES_{11}	Management of intangibles	0	0	0	0	0	0	0	0	0	0	0	1	1%
ES_{12}	Internationalization	0	0	0	0	0	0	1	0	0	0	0	1	1%
ES_{13}	Investments and improvements in services and installations	0	0	0	0	0	0	0	0	0	0	1	1	1%
	Total	2	4	2	2	3	2	2	2	5	4	4	83	100%

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Table 2
Main variables of environmental sustainability extracted from the cross-model analysis.

Code	Variables	Araújo (2010)	Azapagic (2004)	Buson et al. (2009)	Carvalho and Rabechini (2011)	DJSI (2013)	Elkington (2012)	ETHOS (2012)	Fellows and Liu (2008)	Fernández-Sánchez and Rodríguez-López (2010)	Fiksel et al. (1999)	GRI (2013)	ICHEME (2002)	Labuschagne et al. (2005)
ENS_1	Natural resources (reduction of resource use, material input and output minimization, reduction of waste production and soil contamination, impact reduction)	1	1	1	1	0	1	1	1	1	1	1	1	1
ENS_2	Energy (generation, use, distribution, and transmission of energy, global warming)	1	1	1	1	1	0	0	1	1	1	1	1	1
ENS_3	Water (water quality, reduction of liquid waste, risks)	0	1	0	1	1	0	0	1	1	1	1	1	1
ENS_4	Biodiversity (air, protection of oceans, lakes, coasts, forests)	0	1	0	0	0	0	1	1	1	1	1	0	1
ENS_5	Management systems of environmental policies (environmental obligations, environmental adaptation, infractions)	0	0	0	1	1	1	0	1	0	0	1	0	0
ENS_6	Management of impacts on the environment and the life cycle of products and services (analysis of product disassembly, post-sale tracking, reverse logistics)	0	0	1	1	0	0	1	0	0	0	0	1	1
ENS_7	Eco-efficiency (business opportunities for products and services, environmental footprint)	1	0	0	1	1	1	0	0	0	1	0	0	0
ENS_8	Environmental justice and responsibility (intergenerational equity, compromise with the improvement of environmental quality)	0	0	0	0	0	1	1	0	0	0	0	0	0
ENS_9	Environmental education and training	0	0	0	0	0	1	1	0	0	0	0	0	0
ENS_{10}	High-risk projects, climate strategy and governance	0	0	0	1	1	0	0	0	0	0	0	0	0
ENS_{11}	Environmental reports	0	0	0	0	1	0	0	0	0	0	0	0	0
	Total	3	4	3	7	6	5	5	5	4	5	5	4	5

Note: The results of the correlations mean that the model in vertical line (1) presents the variable and (0) does not present the variable. The total account in each column shows the variables cited in each model. The total account in each line represents how many surveyed models consider the same variable.

Table 2 (*continued*)

Code	Variables	Liu et al. (2013)	Mulder and Brent (2006)	Pulaski and Horman (2005)	Sarkis et al. (2012)	Savitz (2006)	Silvius et al. (2013)	Spangenberg and Bonniot (1998)	UNCSD (2001)	VDI 4070 (2006)	Veleva and Ellenbecker (2001)	Xing et al. (2009)	Total	%
ENS_1	Natural resources (reduction of resource use, material input and output minimization, reduction of waste production and soil contamination, impact reduction)	0	1	1	1	1	1	1	1	1	1	1	22	23.158
ENS_2	Energy (generation, use, distribution, and transmission of energy, global warming)	0	0	1	1	1	1	0	0	1	1	1	18	18.947
ENS_3	Water (water quality, reduction of liquid waste, risks)	1	1	1	1	1	1	0	1	1	1	1	19	20
ENS_4	Biodiversity (air, protection of oceans, lakes, coasts, forests)	0	1	0	0	0	0	0	1	0	0	1	10	10.526
ENS_5	Management systems of environmental policies (environmental obligations, environmental adaptation, infractions)	0	0	0	0	0	0	0	0	1	0	0	6	6.3158
ENS_6	Management of impacts on the environment and the life cycle of products and services (analysis of product disassembly, post-sale tracking, reverse logistics)	0	0	0	1	0	0	0	0	0	0	0	6	6.3158
ENS_7	Eco-efficiency (business opportunities for products and services, environmental footprint)	0	0	0	0	0	0	0	0	0	0	0	5	5.2632
ENS_8	Environmental justice and responsibility (intergenerational equity, compromise with the improvement of environmental quality)	0	0	0	0	0	0	1	0	0	0	0	3	3.1579
ENS_9	Environmental education and training	0	0	0	0	0	0	1	0	0	0	0	3	3.1579
ENS_{10}	High-risk projects, climate strategy and governance	0	0	0	0	0	0	0	0	0	0	0	2	2.1053
ENS_{11}	Environmental reports	0	0	0	0	0	0	0	0	0	0	0	1	1.0526
	Total	1	3	3	4	3	3	3	3	4	3	4	95	100%

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Table 3
Main variables of social sustainability extracted from the cross-model analysis.

Code	Variables	ETHOS (2012)	GRI (2013)	Silvius et al. (2013)	Labuschagne et al. (2005)	Azapagic (2004)	DJSI (2013)	Mulder and Brent (2006)	VDI 4070 (2006)	Xing et al. (2009)	Fernández-Sánchez and Rodríguez-López (2010)	Liu et al. (2013)	Veleva and Ellenbecker (2001)	Elkington (2012)
SS_1	Labor practices (health, safety and working conditions, training and education)	1	1	1	1	1	1	1	1	1	1	0	1	0
SS_2	Labor practices (relations with employees, employment, diversity, opportunity, remuneration, benefits and career opportunities)	1	1	1	1	1	0	1	1	1	0	0	1	0
SS_3	Relationships with the local community (impacts, child labor, human rights, non-discrimination, indigenous rights, forced and compulsory labor)	1	1	1	1	1	0	1	1	0	1	1	1	1
SS_4	Engagement of stakeholders	1	0	1	1	1	1	1	1	1	0	0	0	1
SS_5	Financing and construction of social action (philanthropy and corporate citizenship, governmental social projects, leadership and social influence)	1	0	0	0	0	1	1	0	1	1	1	0	0
SS_6	Society (competition and pricing policies, anti-bribery and anti-corruption practices and suborn)	1	1	1	1	0	0	0	0	1	0	0	0	0
SS_7	Concepts of social justice	0	0	0	0	1	0	0	0	0	0	1	1	1
SS_8	Relationships with suppliers and contractors (selection, evaluation, partnership)	1	0	1	1	0	1	0	0	0	0	0	0	0
SS_9	Society (contribution to social campaigns)	1	1	0	0	0	0	0	0	0	1	1	0	0
SS_{10}	Products and services (responsibility, consumer health and safety, maketing, respect and privacy)	0	1	1	0	0	0	0	0	0	0	0	0	0
SS_{11}	Human rights (freedom of association and collective bargaining and relationship with trade unions)	1	1	1	0	0	0	0	0	0	0	0	0	0
SS_{12}	Human rights (strategy and management, disciplinary procedures)	0	1	0	0	0	0	0	1	0	0	0	0	0
SS_{13}	Social reports	0	0	0	0	0	1	0	0	0	0	0	0	0
	Total	9	8	8	6	5	5	5	5	5	4	4	4	3

Note: The results of the correlations mean that the model in vertical line (1) presents the variable and (0) does not present the variable. The total account in each column shows the variables cited in each model. The total account in each line represents how many surveyed models consider the same variable.

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Table 3 (*continued*)

Code	Variables	ICHEME (2002)	Sarkis et al. (2012)	Savitz (2006)	Spangenberg and Bonniot (1998)	UNCSD (2001)	Araújo (2010)	Buson et al. (2009)	Fiksel, McDaniel and Mendenhall (1999)	Pulaski and Horman (2005)	Carvalho and Rabechini (2011)	Fellows and Liu (2008)	Total	%
SS_1	Labor practices (health, safety and working conditions, training and education)	1	1	0	1	1	1	1	1	1	1	1	21	21%
SS_2	Labor practices (relations with employees, employment, diversity, opportunity, remuneration, benefits and career opportunities)	0	1	1	1	0	1	0	1	1	1	0	16	16%
SS_3	Relationships with the local community (impacts, child labor, human rights, non-discrimination, indigenous rights, forced and compulsory labor)	0	0	1	1	1	0	0	0	0	1	0	15	15%
SS_4	Engagement of stakeholders	1	1	0	0	0	0	1	0	0	1	0	13	13%
SS_5	Financing and construction of social action (philanthropy and corporate citizenship, governmental social projects, leadership and social influence)	1	0	0	0	0	0	0	0	0	0	0	7	7%
SS_6	Society (competition and pricing policies, anti-bribery and anti-corruption practices and suborn)	0	0	0	0	0	0	0	0	0	0	0	5	5%
SS_7	Concepts of social justice	0	0	0	0	1	0	0	0	0	0	0	5	5%
SS_8	Relationships with suppliers and contractors (selection, evaluation, partnership)	0	0	0	0	0	0	0	0	0	1	0	5	5%
SS_9	Society (contribution to social campaigns)	0	0	0	0	0	0	0	0	0	0	0	4	4%
SS_{10}	Products and services (responsibility, consumer health and safety, maketing, respect and privacy)	0	0	1	0	0	0	0	0	0	1	0	4	4%
SS_{11}	Human rights (freedom of association and collective bargaining and relationship with trade unions)	0	0	0	0	0	0	0	0	0	1	0	4	4%
SS_{12}	Human rights (strategy and management, disciplinary procedures)	0	0	0	0	0	0	0	0	0	0	0	2	2%
SS_{13}	Social reports	0	0	0	0	0	0	0	0	0	0	0	1	1%
	Total	3	3	3	3	3	2	2	2	2	7	1	102	100%

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There were also concerns about complying with existing regulations, development of environmental policies, as well as ideas about expanding environmental education and training (see Table 2).

The social dimension was composed of a total of 270 raw codes, grouped in 13 affinity code groups (see Table 3). The main concern was the well-being of the people involved in the projects. Other concerns were related to appropriate labor practices for employees and contractors. Similarly, it was evident that there was a great concern about the engagement of stakeholders, relationships with the neighboring community, and child labor. Additional concerns included human rights, the impacts of products and services, the financing of social actions, and the impacts of company operations on social systems.

3. Research methods

In order to achieve the research goal of identifying the key aspects of sustainability in project management context, the research design merges the systematic literature review (SLR) and the survey-based research.

3.1. The systematic literature review (SLR) and research instrument design

The literature review helps to identify the key aspects linking PM literature and sustainability literature. The SLR can be performed through applying qualitative and quantitative methods as the bibliometric approach (Narin, 1976), meta-analysis, content analysis, and semantic analysis (Carvalho et al., 2013).

The first step of SLR, data collection, involved a systematic periodic search for articles conducted between March 2014 and July 2014, using several search strings related to sustainability and project management, but focusing on the last 20 years. The total sample analyzed was composed of 199 publications. Studies with a triple-bottom-line focus accounted more than 50% of the total sample of publications. An analysis of the chronology of the publications showed major peaks in 2012, 2013, and 2014 (40.7% of all publications), but the process of research about sustainability in project management was really started in 2005, perhaps because of the importance of publications related to authors such as Labuschagne and Brent, but driven by WCED concepts of 1987. Even so, publications from the last 5 years (from 2010 to July 2014) represent 55.2% of the total of all publications. Furthermore, more than 60% of the publications that came from the peer-review process were developed through case studies, methodology, or theoretical studies. In addition, survey research methods have recently been used in this field. These results show that the study of sustainability in project management is still in the exploratory stage, which is consistent with Silvius et al. (2013), Valdes-Vasquez and Klotz (2013), and Singh et al. (2012).

The content analysis focused on identifying sustainability models that included constructs or factors of sustainability related to the TBL concept and which could be applied to project management context. The literature was screened, classified, and coded, with frequency counts and cross-tabulations as suggested by the content analysis literature (Duriau et al., 2007). To analyze and summarize the various models of sustainability in project management described in the literature, we adopted computer-aided text analysis, using the Sphinx software tool (Freitas and Janissek, 2000) to identify and group sustainability variables related to project management, as well as the content analysis was used. The summary of the SLR was presented in Section 2, focusing on the results of the content analysis of the surveyed literature and in identifying the key factors.

The SLR was the basis for the research questionnaire that was designed focusing on the variables of sustainability in project management (Tables 1, 2, and 3) identified in the content analysis phase. The research questionnaire was developed, with predominantly closed questions, using perception 9 points scale ranging from 1 (equal importance) to 9 (absolute importance), following the so-called "psychological threshold," in which humans can judge a maximum of 7 ± 2 (Saaty, 1991). For each variable described in Tables 1–3, the respondents evaluated a statement formulated to be answered on a nine-point perception scale, as exemplified in Table 4.

The research instrument content validation was performed with experts in both areas PM and sustainability in Brazil (3

Table 4
Research questionnaire: Example of the first question on three TBL dimensions.

You should choose one complex project finished recently that you took part of it. Respond what is the degree of usage that answers the statement bellow more appropriately. Similarly to the degree of importance.	Degree of usage (Is this issue really applied in your project?)	Degree of importance (The quality or state of being important: value or significance)
(ES1) The chosen project is evaluated with respect to financial and economic performance. Is it important? (Examples: return on investments, solvency, profitability, liquidity, liquidity, value added, profit sharing, market share, and gross domestic product)	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
(ENS1) Natural resources are evaluated in the chosen project. Is it important? (Examples: reduction of resource use and waste production, recycling, reduction of impacts and soil contamination)	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
(SS1) The management labor practices are applied to the selected project. Is it important? (Examples: health and safety, working conditions, training and education, employee relations, employment, diversity and opportunity, compensation, benefits, and career)	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9

Note: Scale varies from "1" "Totally disagree" to "9" "Totally agree."

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professors) and USA (2 professors). Face validation was performed with 3 project managers that were invited to analyze the research instrument in terms of questions' clarity and time consuming. After performing content and face validation, as the recommendations of the literature (Netemeyer et al. 2003), the questionnaire was revised. This research questionnaire was then applied online (made available on a web link), using the Sphinx software (Freitas and Janissek, 2000) to collect data, store and perform the statistic analysis.

3.2. The survey-based research: Sampling and data analysis

Thus, the survey-based research was selected for investigating the importance of the key factors extracted from the literature reviews based on project managers' lens. Survey research fits the cases in which the researcher wishes to answer questions regarding the distribution of the variables or the relationships among characteristics of people or groups, allowing generalization for a broader population (Forza, 2002).

The survey-based research was performed with project managers of Brazilian companies. The size of the sample was estimated applying the power test (Cohen, 1988) with the use of G*Power 3.1.9.2 software (Faul et al., 2009), which took into account the effect size of 0.15 (average value), the test power level of 0.95 or 95%, and the maximum allowed error of 5%, as recommended by Cohen (1988). Considering those parameters, the minimum calculated sample was 89 questionnaires.

The respondents selected for this research are professionals responsible for project management in Brazilian companies. The contact list and respondents' profile were first generated through Linkedin professional social media. The fit of the possible respondent with the desirable project manager profile was analyzed in the following phases: (1) to find responsible project managers in the Linkedin network, (2) to analyze all selected profiles according to the research protocol profile, (3) to check Linkedin profile information with available data about the respondent's respective organization such as phone and job description, (4) to send through email or Linkedin an invitation for selected professionals about our survey and ask about interest in participating, (5) to send the questionnaire link for all people that accepted our previous invitation. Thus, a thousand and fifty invitations were sent to contacts of selected professionals with the desired profile, asking them to fill out the online questionnaire. It was carried out from October to December 2014. Concerning the response rate, of 1050 invitations, 143 responses were obtained, yielding a response rate of 13.6%, which is consistent with other researches in the operations management fields, for example, Pagell et al. (2015) had 12.1% response rate in their study. Further, this sample with 143 valid questionnaires has a statistical power of 99.58%, according to G*Power analysis.

The data analysis was performed through descriptive statistics and exploratory factor analysis following the literature recommendations (Hair et al., 2006). According to these authors, factor analysis is a multivariate statistical method that has the proposal of defining a subjacent structure in a matrix of data, e.g., it analyzes the structure of the inter-relations (correlations) between variables, defining a set of common latent dimensions called factors. Moreover, Conway and Huffcutt (2003) argue that exploratory factor analysis can be useful in refining measures, evaluating construct validity, and in some cases, testing hypotheses.

The factors were extracted using the principal component method where the factors are based on the total variance, and Varimax rotation, which is a method of orthogonal factor rotation intending just some factors to have significant loads and the goal is to maximize the variance between loads of each principal component (Hair et al., 2006). The data analysis was performed using the SPSS17 software.

4. Key factors for sustainability in project management

In this section, it will be presented the main results of this survey conducted with Brazilian companies that are working with project management, so it focused on collecting responses from project managers. The sample was gathered from the Linkedin social network. The profiles were analyzed individually for each searched candidate who responded to the survey. When the profile of the respondent was approved as fitting the research protocol, we invite them to answer our questionnaire. Likewise, this section shows the factor analysis treatment and some discussions about it in the context of sustainability in project management.

4.1. Sample demographics

The sample respondents are in the majority from companies in the services sector (65.03%), whereas just 34.97% are from industries. From the validated respondents, 75% are project managers and project directors, and 25% are project coordinators and members of project teams. Sub-sectors of technology and information systems stand out with 19.6%; project consultancy appears with 12.8% and automotive sector with 11.5% of the respondents.

The summary of the descriptive statistic of each variable is presented in Table 5. It shows that the economic and social dimensions receive more attention in project management than the environment dimension. It is an interesting insight, once some studies suggest that social dimension represents a major gap (Labuschagne et al., 2005; Singh et al., 2012). It could be also related to the sample concentration on the service sector.

It can be seen (Table 5) that variable ES03 (Business ethics) has given median 9. It means that more than 50% of all project managers surveyed are concerned by ethics issues when working on projects, corroborating Fernández-Sánchez and Rodríguez-López (2010) and Veleva and Ellenbecker (2001). Whereas, the variable ENS07 (Eco-efficiency) received the lowest median score, 3, and it can be concluded that issues related to getting new business opportunities for products and services and for example environmental footprint are not important in project management context, contrasting arguments from authors such as Fiksel et al. (1999) and Carvalho and Rabechini (2011).

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Table 5
Factors extracted from factor analysis and descriptive statistics.

Factors	Variables	Factors loads	% variance explained	Communalities	Median	Stardard deviation
1 — Environmental policies and resources saving	ENS05 — Management of environmental policies	0.916	45.849	0.890	5	3.26
	ENS04 — Air	0.902		0.845	4	3.10
	ENS06 — Management of environmental impacts	0.900		0.865	4	3.17
	ENS03 — Water	0.888		0.834	4	3.15
	ENS08 — Commitment and environmental responsibility	0.885		0.871	5	3.23
	ENS01 — Natural resources	0.872		0.842	5	3.03
	ENS07 — Eco—efficiency	0.776		0.693	**3**	3.07
	ENS02 — Energy	0.749		0.657	5	3.13
	ES02 — Financial benefits of environmental and social good practices	0.614		0.560	5	2.79
2 — Economics and competitive advantage	ES04 — Cost management	0.778	13.417	0.675	7	2.07
	ES01 — Financial and economic performance	0.692		0.501	7	2.37
	ES05 — Management of the relationship with customers	0.681		0.502	7	2.33
	ES06 — Participation and involvement of stakeholders	0.663		0.511	8	1.73
	ES03 — Business ethics	0.605		0.554	**9**	1.98
3 — Stakeholders management (society, employee, suppliers and contractors)	SS06 — Relationships with Society	0.723	5.576	0.728	6	3.05
	SS11 — Management of human rights	0.700		0.750	7	3.07
	SS03 — Relationships with local community	0.685		0.783	6	3.25
	SS08 — Relationships with suppliers and contractors	0.669		0.703	8	2.22
	SS10 — Responsibility with Products and services	0.615		0.682	7	2.76
	SS04 — Engagement of stakeholders	0.532		0.620	7	2.60
	SS01 — Labor practices	0.461		0.566	8	2.35
4 — Sustainable innovation business model	ES09 — Management of Organization Culture	0.833	4.726	0.777	6	2.56
	ES07 — Management of Innovation	0.544		0.592	7	2.53

Note: There are missing variables comparing Tables 1–3 and Table 4. It occurs due to the extraction of variables with communalities less than 0.5 (Hair et al., 2006).

4.2. Factor analysis

The application of factor analysis using SPSS17 was developed. The outputs of factor analysis pointed out that the Bartlett's Test (sphericity test) and the Kaiser–Meyer–Olkin KMO (Measure of Sampling Adequacy—MAS) with a value of 0.910 were significant at the level of 0.05%. These two tests indicate the suitability of the data for structure detection (Hair et al., 2006). In the same way, the communality analysis showed that 23 variables presented extraction values greater than 0.5. These values showed that the factor analysis was suited to be applied. In addition, a set of 23 variables remained in the factor analysis. According to Hair et al. (2006, p.131), "the researcher would identify all variables with communalities less than 0.5 as not having sufficient explanation." In Table 5, we do not show these variables that presented no satisfactory communality.

In order to extract the factors that explain this set of variables included in the factor analysis, principal component analysis and Varimax rotation were applied. The factor loadings for each factor after the rotation of the axes (with the communalities) and the coefficients of the score of the factors are provided in Table 5. This analysis suggested a reduction to 4 factors, determined by the number of eigenvalues higher than 1 (one), explaining 69.57% of the variability in the original variables (see Table 5). The rotation converged after 6 interactions. This percentage considerably reduces the complexity of the set of data when used these factors or components with 30.03% of loss of information from the variables.

It is possible to perceive in Table 5 that 23 variables were maintained in the framework when looking at the values of the communalities. However, the factor analysis suggested a reorganization of variables taking into account the four factors created. The new factor created and named Sustainable Innovation Business Model, having just 4.726% of variance explained, received two variables from economic dimension (management of organizational culture and management of innovation).

The environmental dimension, named Environmental Policies and Resources Saving, with 45.849% of variance explained, maintained eight original variables and received one new variable from economic dimension (ES02) that is related to financial benefits of environmental and social good practices.

The economic dimension (13.417% of explained variance), now called Economics and Competitive Advantage, gave two variables to factor number four and one to factor one, and in this case remain five variables composing the Economics and Competitive Advantage (ES01, ES03, ES04, ES05 e ES06). As a matter of fact that the factor 3 with 5.576% of the extracted

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variance (social dimension), named Stakeholders Management (society, employee, suppliers, and contractors) remained no exactly the same when compared with the initial model, i.e. with 7 variables.

5. Discussion of the results

According to Silvius et al. (2013), the relationship between project management and sustainability is rapidly gaining interest from professionals and academics. Studies on the integration of sustainability concepts into the management of projects generally address the topic from a conceptual, logical, or moral point of view. Given that the relationship between sustainability and project management is still an emerging field of study, these approaches make sense. However, the findings of our study do not negate the need for more empirical studies to understand how the concepts of sustainable development can be implemented in project management field.

In addition, according to Sarkis et al. (2012), the main aspects of the triple-bottom line approach in projects and project management must be further discussed, modeled, and understood. When a triple-bottom line approach is used, the economic, environmental, and social aspects of a project are better integrated. A set of sustainability variables and indicators is required to make this integration more feasible (Labuschagne et al., 2005; Presley et al., 2007; Rics, 2004; Sarkis et al., 2012). In this way, our results show at the first time a set of variables extracted among nearly 700 variables, that was a hard work in order to define similarities between the names of the variables as well the number of appearance of them in the related models. Furthermore, it is shown a set of reorganization variables that came from factor analysis. As said before, it was paramount to show four new factors that better explain Brazilian project managers' perspective, and this research pointed out that project managers can improve their results in projects when looking at this four factors.

In our study, the first factor *Environmental Policies and Resources Saving*, with 45.849% of variance explained and composed by nine variables, appears with higher importance in project management context. It means that those actually responsible for project management are concerned about topics related to environmental sustainability. The results show that project managers are working on project resource consuming, particularly water and energy, focusing on eco-efficiency, but also on projects' environment impact. The management of environmental policies and standards is a concern of the project managers surveyed, who argue the increasing constraints due to a well-developed system of environmental law which consequently leads to getting the society assured of negative environmental impacts. It brings some implication for practice since hard work on environmental sustainability is demanded in all life cycle phases, but particularly in the initialization phase on environmental licenses and approvals. However, they are confident that it is important and can provide financial benefits from environmental good practices developed in projects.

The second factor, *Economic and Competitive Advantage*, shows that 13.417% of explained variance from all variables is composed of variables related to cost, financial and economic performance of the project, but taking care of compliance issues and ethics. Particularly, in the surveyed sample in Brazil, compliance and ethics in projects received the highest score among all variables (see Table 5) due to corruption scandals, particularly on public and private partnership (PPP), which is a great concern. Thus, the customers' involvement and stakeholders' participation should be handling with business ethics issues.

The third, *Stakeholder Management* factor related to social sustainability, in both internal and external issues, is appearing in our study with 5.576% of the extracted variance. The project management literature pointed out several discussions on social topics applied in project management, but our study pointed out that in Brazilian context, social issues related to stakeholders need to be worked, particularly issues related to labor practices, and human rights in project team members are the main concern of the surveyed project managers. The relations evolving local communities and society, in general, were also emphasized. However, the partnership with external stakeholders in the supply chain (contractors and suppliers) and the responsibilities with products and services are major concerns in this factor.

Giving attention to the fourth factor named here as *Sustainable Innovation Business Model* merging Management of Organization Culture and Management of Innovation, our findings show that Brazilian project managers are considering projects issues related to organizational culture variables. It is paramount to work on this because, as suggested by the literature, the sustainability challenges can be seen as innovation opportunities, offering new solutions (York and Venkataraman, 2010), which demand incorporating the social mission in corporate culture and innovation, enabling shared value creation (Pfitzer et al., 2013). Thus, if project members work on issues related to innovation for sustainability, there is a great chance of obtaining sustainable innovation business models. These insights related to the fourth factor can lead new research agenda in corporate and academic fields.

Authors such as Fernández-Sánchez and Rodríguez-López (2010) have analyzed current problems in sustainability practices. They identify a need to establish a method for identifying and selecting a set of indicators that include all participants involved in the life cycle of a project to find an appropriate balance between all involved actors. Sustainability is proposed by these authors as an opportunity for improvement throughout a project. As we have shown in Tables 1, 2, and 3, the set of variables includes some related indicators, but these are not all to be used in project management, and it is clear that our study clears some gaps evidenced in Section 2 contributing and advancing in this discussion. On the other hand, the gap remains and it is an opportunity to research more about it, taking into account, for example, another form of view sustainability in project management.

Furthermore, there are considerable challenges in developing resource-related projects that meet the ideals of sustainability. The principles and policies of corporate sustainability are difficult to integrate into project management systems (Corder et al., 2012).

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In addition, existing systems do not easily provide innovative solutions for dealing with key goals of sustainability, such as significantly reducing carbon emissions and minimizing environmental impacts while maintaining a license to operate in society. We believe that the results of our research can help project managers to plan new strategies in order to improve sustainability resulting in more success in the project, especially in new and better-planned projects using our approach.

As discussed in Section 2, it is clear for all that business sustainability needs to involve the incorporation of the objectives of sustainable development, social equity, economic efficiency, and environmental performance into the operational practices and projects of a company. Companies that compete globally increasingly need to commit to being informed about the global sustainability performances of operational initiatives. The current frameworks of variables and indicators available to measure the overall sustainability of business do not deal effectively with all aspects of sustainability at the operational level, especially in developing countries (Labuschagne et al., 2005). As one of the contributions of our research, the set of variables of sustainability gathered from several models that came from different sectors can be immediately used by practitioners of project management. Looking at the results of the factor analysis from Brazilian project managers' perspective, this set of variables that remained in the model shown in Table 5 can be considered well fit in Brazilian context, and more organized to use or create assessment systems as well, seeking for improving results in projects such as efficiency, linked to cost, time, and scope, as well as benefits to project team, benefits for the clients (Shenhar and Dvir, 2007). Other results can be obtained when sustainability is a reality in project management, for example, the perpetuation of the economic, environmental, and social sustainable benefits (Martens and Carvalho, 2016; Carvalho and Rabechini, 2015).

6. Final considerations

This study contributes to the literature by exploring the gap in sustainability and project management. This paper identified relevant literature and structured it in the key variables. As suggested by Singh et al. (2012) and Welsch (2005), there is a large amount of room for additional research in the area of sustainability in project management. This study also revealed that, in recent years, the number of publications about the research topic have grown but remain dispersed across different fields.

As a theoretical contribution, this study provided a summary of key variables according to the extant literature (Tables 1, 2, and 3) that provide initial insights at the nexus of sustainability and project management for subsequent empirical development. Moreover, we explore the project managers' perspective of these variables through a survey-based research. As a result, four factors stood out that explain sustainability in project management in the project managers' perspective: Sustainable Innovation Business Model, Stakeholders Management, Economics and Competitive Advantage, and Environmental policies and resources saving. The four factors also show that the strategic perspective of TBL sustainability in project management is relevant as named in the grouped factors.

As a contribution, a literature review that revealed a series of variables that could be applied for various applications in different sectors. Due to the literature systematization, further researches can use these variables to parameterized or customized in project management or other endeavors by organizations seeking sustainability, as an assessment instrument. Finally, future research focusing on the validation and structuring of sustainability constructs and variables within a triple-bottom line framework would be useful. Promoting field researches exploring these factors in case studies should be interesting. Moreover, other surveys exploring contingent variables as sectors and countries could be performed. In addition, we suggest that an interesting research could be to take into account the concept of resilience in order to develop a model merging themes, sustainability, and resilience in project management.

This research has limitations concerning the research design. First, the results are limited to just one country, Brazil, and the sample was composed mainly of service companies. For this reason, the generalization of these results has limitation.

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