



THE RELATION BETWEEN SUSTAINABLE PROJECT MANAGEMENT AND PROJECT SUCCESS

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ABSTRACT

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Projects play a pivotal role in the transition of business and organizations towards more sustainable practices. This role requires a reconsideration of the way projects are planned, organized, executed, managed and governed. A sustainability perspective on project management is emerging in literature as Sustainable Project Management, however a gap is observed between the literature and what is carried out in practice. The potential benefits of considering sustainability in project management, such as improved project success, play an important role in the adaptation of sustainable project management. The relationship between sustainable project management and project success has been addressed in a number of studies. And although in most of these studies, considering sustainability shows to have a positive effect on project success, the relationship still needs more research. It is this gap in the literature that the study reported addresses. The study aimed to answer the question how considering sustainability in project management relates to project success? Based on a quantitative survey-based research design, the study found a strong positive correlation between sustainable project management and project success. The findings confirm the conclusions found in the earlier studies and provide another indication that considering sustainability in project management supports project success.

Contribution/Originality: The study contributes to the understanding of the relationship between SPM and PS, with some interesting findings. Also, the operationalization of the variables SPM and PS, in which the study closely follows the latest insights from literature, adds a new element to the literature.

1. INTRODUCTION

Businesses and organizations are increasingly pursuing the integration of sustainability into the strategies and practices of their businesses (BSR/GlobeScan, 2019). This integration influences a wide range of functional areas in the organization, such as strategy, research and development, human resources management, supply chain management and finance (Tulder, Van Tilburg, Francken, & Da Rosa, 2014). The transition towards more sustainable business practices requires the changing of products, services, business model, processes, systems and resources of companies (Tulder et al., 2014). Projects play an instrumental role in implementing these organizational changes and thereby the sustainable development of organizations and society (Marcelino-Sádaba, Pérez-Ezcurdia, & González-Jaen, 2015).

The pivotal role of projects in the transition towards sustainability of businesses, organizations and society requires a reconsideration of the way projects are planned, organized, executed, managed and governed (Silvius &

Schipper, 2014). This sustainability perspective on project management (Silvius, 2017) is addressed in a growing number of studies (Aarseth, Ahola, Aaltonen, Økland, & Andersen, 2017; Sabini, Muzio, & Alderman, 2019; Silvius & Schipper, 2014), however, a gap can be observed between the literature and what is carried out in practice (Okland, 2015).

When studying the factors that stimulate project managers to address sustainability, Silvius and de Graaf (2019) found that the potential benefits of considering sustainability in the project, such as project success, play an important role in the adaption of sustainable project management practices. The more favourable the project manager beliefs the outcome of considering sustainability in the project will be, the more likely he or she is willing to consider sustainability.

Project success is indicated as one of the ‘impact areas’ of sustainability in project management (Silvius, Schipper, Planko, van den Brink, & Köhler, 2012) and the relationship between project success and sustainability is identified as one of the emergent ‘narratives’ in the literature on sustainable project management (SPM) (Sabini et al., 2019). Studies on this relationship are still limited in quantity as a structure literature review on the topic found only five studies that specifically focussed on the relationship (Khalifeh, Farrell, & Al-edenat, 2019) quality. The studies also differ in their operationalization of the variables SPM and project success, making it hard to derive an overall and undisputable conclusion. For example where Martens and Carvalho (2016a) found that considering sustainability is expected to have a positive effect on project success, Silvius and Schipper (2016) concluded that “*paying attention to sustainability aspects in projects may also be perceived as costing time or money and therefore as not supportive to the time and budget constraints of a project*”. We therefore agree with Khalifeh et al. (2019) that conclude that this relationship is still inadequately addressed in the literature and that more research is needed. It is this gap in the literature that the study reported in this paper addresses. Based on a quantitative survey-based research design, this study aims to answer the question *How does considering sustainability in project management relate to project success?*

The remainder of the paper is organized as follows. In the following paragraph, the main variables of the study, sustainable project management (SPM) and project success (PS) will be described based on the literature on these topics. The largest part of the review of the literature will be devoted to the discussion of earlier studies on the relationship between sustainable project management and project success. The design and methodology of the study is revealed in the third paragraph of this paper, after which the following paragraph will discuss the findings and the data analysis. The paper will be concluded with a reflection on the findings and the answering of the research question.

2. BACKGROUND LITERATURE

In this paragraph, the main variables of our research question, SPM and PS will be explored. We used Google Scholar as search engine in our search for relevant literature. As PS is a frequently studied topic in academic literature, we relied on earlier published literature reviews on the topic, specifically Ika (2009) to guide the operationalization of this variable. On SPM also a number of structured literature reviews were published in the last decade, specifically Silvius and Schipper (2014) and Sabini et al. (2019). These literature reviews provided a solid foundation for our understanding of the concept of SPM.

For the analysis of literature that specifically focus on the relationship between SPM and PS, we formulated a series of search strings that were all variations of the main search string “PROJECT+SUCCESS+SUSTAINABILITY”. We expanded our search based on the sources used in the publications that were found. In total 63 publications were identified that based on their abstracts were reduced to 15 relevant studies. After reading the full papers, our analysis focused on 12 articles that specifically addressed the relationship between SPM and PS variables.

This paragraph will first discuss the characteristics of SPM that show from the literature. Following this, the concept of success in projects and project management will be discussed. The literature review will be completed with a discussion of earlier studies on the relationship between SPM and PS.

2.1. Sustainable Project Management

The balance between economic growth and social wellbeing has been around as a political and managerial challenge for over 150 years (Dyllick & Hockerts, 2002). However, the more contemporary concerns about sustainability may have been initiated by the book *"The Limits to Growth"*, by Meadows, Meadows, Randers, and Behrens (1972). In the book, the authors concluded that if the world's population and economy would continue to grow at their current speeds, our planet's natural resources would approach depletion. The Limits to Growth fuelled a public debate, leading to installation of the UN 'World Commission on Development and Environment', named 'the Brundtland Commission' after its chair. In their report, the Brundtland commission defined sustainable development as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (World Commission on Environment and Development, 1987). Behind the intertemporal focus of the definition, the requirement of a balance or harmony of different type of capitals is hiding (Pearce & Atkinson, 1993). In his book *"Cannibals with Forks: the Triple Bottom Line of 21st Century Business"*, Elkington refers to these different types of capital as the 'Triple Bottom Line' (TBL) of economic, social and environmental perspectives (Elkington, 1994). *"In its broadest sense, sustainable development strategy aims at promoting harmony among human beings and between humanity and nature"* (World Commission on Environment and Development, 1987). The vision that economic growth, social wellbeing or a wise use of natural resources, cannot be reached in isolation, got widely accepted (Keating, 1993). Sustainability is about the balance or harmony between economic, social and environmental interests (Elkington, 1994).

The 1990s saw an extension of the concept of sustainable development (Steurer, 2001) when links were established between sustainable development on societal level and sustainability in businesses (Das, 2009). Acknowledging the role projects play in the sustainable development of organizations and society, Silvius and Schipper (2014) conclude that the concepts of sustainability should be integrated in the way projects are planned, organized, executed, managed and governed. Several studies (Aarseth et al., 2017; Sabini et al., 2019; Silvius & Schipper, 2014) report a growing number of studies that address the integration of sustainability into project management and 'Sustainable Project Management' is considered one of the most important global project management trends today (Alvarez-Dionisi, Turner, & Mittra, 2016). In a first structured review of the emerging literature on sustainability and project management, Silvius and Schipper (2014) found that the TBL concept (Elkington, 1994) was the most used interpretation of sustainability. Based on this, they define SPM as *"the planning, monitoring and controlling of project delivery and support processes, with consideration of the environmental, economic and social aspects of the life-cycle of the project's resources, processes, deliverables and effects, aimed at realizing benefits for stakeholders, and performed in a transparent, fair and ethical way that includes proactive stakeholder participation."* (Silvius & Schipper, 2014).

From the literature on SPM, it appears that the relationship between sustainability and project management can be interpreted in two ways (Sabini et al., 2019; Silvius, 2015). These two interpretations are characterized by Huemann and Silvius (2017) as:

- "Sustainability by the project" (SbP): the sustainability of the deliverable or result that the project realizes.
- "Sustainability of the project" (SoP): the sustainability of the delivery and management processes of the project.

In SbP, sustainability is mainly considered with regards to the deliverable or result of the project. Frameworks of sustainability are used to define or assess the content related aspects of the project (Silvius & Schipper, 2014), such as the specifications and design of the project's deliverable (Aarseth et al., 2017; Brones, Carvalho, & Zancul, 2014) materials used (Akadiri, 2015) benefits to be achieved (Silvius et al., 2012; Weninger & Huemann, 2013),

quality and success criteria (Martens & Carvalho, 2017). Studies on the integration of sustainability into project management that take this content related perspective, often focus on operationalizing the TBL concept (Elkington, 1994) by developing sets of indicators on the different perspectives (For example Bell & Morse, 2003; Edum-Fotwe & Price, 2009; Fernández-Sánchez & Rodríguez-López, 2010; Keeble, Topiol, & Berkeley, 2003; Labuschagne & Brent, 2008; Martens & Carvalho, 2017).

In SoP studies, the sustainability perspective is applied to the processes of project delivery, management and governance, such as the identification and engagement of stakeholders (Eskerod & Huemann, 2013), the process of procurement in the project (Molenaar & Sobin, 2010), the development of the business case (Weninger & Huemann, 2013), the monitoring of the project (Sánchez, 2015) the identification and management of project risks (Silvius & Schipper, 2016) the communication in and by the project (Pade, Mallinson, & Sewry, 2008) and the selection and organization of the project team (Silvius & Schipper, 2014).

In one of the first publications on sustainability and project management, Labuschagne and Brent (2005) link the two interpretations, SoP and SbP, by elaborating on the life-cycle orientation of sustainability. Project management logically considers the life cycle of a project, from its initiation to its closure. However, Labuschagne and Brent argue that from a sustainability perspective, project management should not only consider the life cycle of the project, but also of the deliverable or result the project realizes, for example a change in products, assets, systems, processes or behaviour. This result -in their words: the ‘asset’- should also be considered over its full life cycle, for example: design–develop–manufacture–operate–decommission–disposal. In the context Labuschagne and Brent were studying, this asset would in its turn have a productive phase (‘operate’), in which it generates value by producing products or services. Elaborating on the life-cycle view even further, they therefore claim that the life cycles of the products or services that the asset produces should also be considered. Considering sustainability in a project would therefore suggest that all three life-cycles, ‘project life cycle’, ‘asset life cycle’ and ‘product life cycle’, are considered, as these life-cycles interact and influence each other. The definition of sustainable project management referenced in the introduction, refers to these interacting life-cycles by stating that in sustainable project management the sustainability perspective is applied to the life-cycles of “*the project’s resources, processes, deliverables and effects*” (Silvius & Schipper, 2014).

2.2. Project Success

The concept of success in projects or project management is one of the most studied concepts in project management research (Ika, 2009). In the literature, a distinction is made between project success *criteria* and project success *factors*. Müller and Jugdev (2012) define these two concepts as:

“- *Project success factors are the elements of a project which, when influenced, increase the likelihood of success; these are the independent variables that make success more likely.*

- *Project success criteria are the measures used to judge on the success or failure of a project; these are the dependent variables that measure success.*” (Müller & Jugdev, 2012).

And although the study reported in this article is aimed at understanding whether considering sustainability in project management may be a *factor* influencing project success, an understanding of how project success is measured or interpreted based on *criteria* of project success is most relevant to our study.

Few people would disagree with the statement that project success is interpretable in many ways. It is, simply put, a rather “*elusive concept*” (Prabhakar, 2008). Most early research on project success seems to emphasize the three traditional dimensions: (within) time, (within) budget and (within) specification (Albert, Balve, & Spang, 2017) also known as the known ‘iron triangle’, “*despite the fact that this method is currently subject to widespread criticism*” (Bakker, Boonstra, & Wortmann, 2010). However, starting around the early 80s of last century, other criteria of success emerged from literature, such as “*measuring success after delivery*” that “*involves looking at the benefits or effectiveness of the project from the perspective of the stakeholder*” (Jugdev & Müller, 2005). Based on a structured review of relevant

studies, Ika (2009) analysed the development of criteria used to assess project success. Figure 1 visualises the development of success criteria he identified.

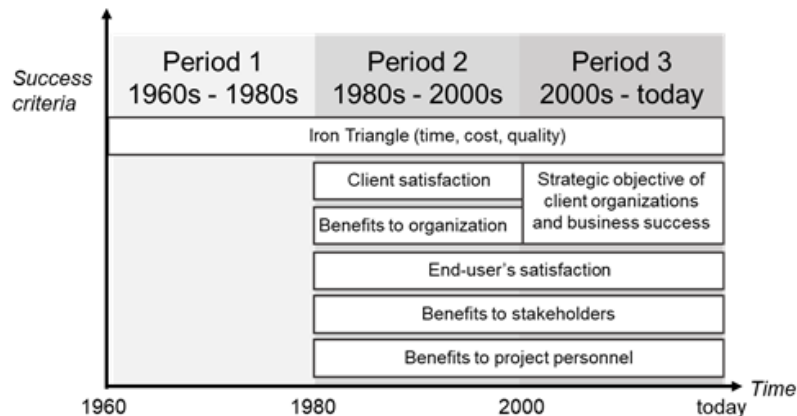


Figure-1. Evolution of project success criteria (based on Ika (2009)).

From Figure 1 it shows that the criteria of PS evolved from the iron triangle of time, cost and quality to a more holistic set of criteria that also included the benefits that the project generates and the satisfaction of stakeholders. As Ika’s overview was published some 10 years ago, it should be discussed which ‘new’ success criteria emerged from studies in the last decade. For example Almahmoud, Doloi, and Panuwatwanich (2012) conclude that criteria for health, safety, and environmental performance should be included in the assessment of PS.

2.3. The Relationship between SPM and PS

Following the distinction made above between project success factors and success criteria, the publications that relate SPM to PS also can be distinguished in these two perspectives. For example, Michaelides, Bryde, and Ohaeri (2014) and Daneshpour (2015) conclude that sustainability should be considered a critical success factor for projects, whereas Kometa, Olomolaiye, and Harris (1995); Lim and Mohamed (1999); Chan and Chan (2004) and Almahmoud et al. (2012) assert that sustainability-related aspects should be included in the criteria for PS.

Table-1. Published studies on the relationship between SPM and PS.

Studies	Nature of the study	Research method	Industries covered	Geographical focus
Mishra, Dangayach, and Mittal (2011)	Conceptual	Literature based	n.a.	n.a.
Craddock (2013)	Conceptual	Literature based	n.a.	n.a.
Tiron-Tudor and Ioana-Maria (2013)	Empirical	Archival analysis (n=35)	Across industries	Across countries
Martens and Carvalho (2014)	Conceptual	Literature review	n.a.	n.a.
Kaysi (2015)	Empirical	Case study (n=1)	Construction	United Kingdom
Silvius and Schipper (2016)	Conceptual	Literature review	n.a.	n.a.
Martens and Carvalho (2016a)	Empirical	Expert panel	n.a.	6 countries
Martens and Carvalho (2016b)	Empirical	Case study (n=4)	Diverse	Brazil & USA
Khalilzadeh, Akbari, and Foroughi (2016)	Empirical	Survey (n=108)	Oil & Gas	Iran
Carvalho and Rabechini Jr (2017)	Empirical	Survey (n=222)	Across industries	Brazil & Peru
Khalifeh et al. (2019)	Conceptual	Literature based	n.a.	n.a.
Malik, Khan, Khan, and Humayon (2020)	Empirical	Survey (n=189)	Construction	Pakistan

Despite this suggestion that considering sustainability should be considered as a factor or criterion for success, the actual relationship between SPM and PS has only received limited coverage in the emerging academic literature on sustainability in project and project management. Table 1 shows the overview of the 12 articles our literature search delivered and that specifically addressed the relationship between SPM and PS.

Despite the limited number of studies on the relationship between SPM and PS, Khalifeh et al. (2019) provide a structured literature review on the topic. And although the minimum number of studies required to perform a structured literature review or a meta-analysis may be as low as two (Ryan, 2016), it may be questioned whether the existing literature base provides sufficient insights for a meta-analysis. More studies into the relationship between SPM and PS, such as the one reported in this article, are therefore necessary.

Table 1 shows that most of the initial studies were conceptual in nature. For example, Mishra et al. (2011) links PS to ethics in business. They conclude that “*The project manager should make sure that he is completing the project while keeping the ethical standards and social impact in mind.*”. Craddock (2013) also links PS to business and therefore aligns the criteria of PS with business excellence models, such as the European Foundation for Quality Management (EFQM) model. And as one of the EFQM model’s fundamental concepts of excellence is “*Taking responsibility for a sustainable future*”, he concludes that sustainability should be integrated in the criteria for PS and that SPM would therefore positively impact PS.

The other conceptual studies, Martens and Carvalho (2014) and. Silvius and Schipper (2016) both build up a conceptual model of the relationship between SPM and PS that later was used in empirical studies (Khalilzadeh et al., 2016; Martens & Carvalho, 2016b). Based on their conceptual model, Silvius and Schipper (2016) provided a conceptual mapping of the different relationships between the dimensions of SPM and the criteria of PS. This mapping showed that the most of the relationships are expected to be positive, however, the expected relationship between SPM and the PS variable completing the project on schedule and within budget is expected as ‘uncertain’.

The rationale behind the uncertain effect of SPM on two of the three ‘iron triangle’ variables of project success comes from the notion that a more sustainable project may require additional investments, for example in better materials, that are projected to deliver a benefit in the medium to long term from lower operation costs (Packard Foundation, 2002). However, these future benefits are by nature uncertain, where the higher investment is not uncertain. In some cases, the higher investment may result in the project not being taken beyond the initial concept and design phases (Pearce, 2008).

Besides this assumed higher investment risk, incorporating environmental and social considerations into projects suggest extra requirements and specifications (Maltzman & Shirley, 2010; Taylor, 2010), which increase the complexity of the project. For example Hwang and Ng (2013) conclude that incorporating sustainability in construction projects makes planning harder, causes more variations in design, causes difficulty in selecting subcontractors, causes uncertainty in the required materials and equipment, requires more coordination with different parties, and leads to more unexpected circumstances at project closure. This increases the pressure on project managers and decision makers (Knight & Jenkins, 2009). Moreover, it has been argued that incorporating sustainability raises the level of expectations of stakeholders of the project (Marcelino-Sádaba et al., 2015) and may increase tensions between them (Brandoni & Polonara, 2012; De Brucker, Macharis, & Verbeke, 2013; Singh, Murty, Gupta, & Dikshit, 2007; Tam, Shen, Yau, & Tam, 2007). Therefore, the expected impact of SPM on the iron triangle variables of PS is considered uncertain.

Next to the conceptual studies, Table 1 also shows seven empirical studies on the relationship between SPM and PS. Table 2 presents how these studies define or operationalise the variables SPM and PS, and what the studies concluded.

Table 2. Overview of empirical studies on the relationship between SPM and PS.

	Operationalization of Project Success (PS)	Operationalization of Sustainable Project Management (SPM)	Main findings
Tiron-Tudor and Ioana-Maria (2013)	Variables of PS: 1. Time & Cost 2. Quality of PM processes 3. Stakeholder engagement 4. Realisation of strategic objectives 5. User satisfaction 6. Organizational impact	SPM operationalized in: 1. Setting the sustainability expectations. 2. Opportunities of reducing costs. 3. Sustainability risks management. 4. Value maximization. 5. Sustainability requirements that are to be to accomplished. 6. Engagement to suppliers and sub-contractors. 7. Motivate the project team.	Authors conclude low correlation between SPM and PS.
Kaysi (2015)	Variables of PS: 1. Time 2. Risk 3. Scope 4. Cost 5. Quality 6. Benefit	Triple Bottom line perspectives of: 1. Economic dimension 2. Environmental dimension 3. Social dimension	Author concludes that sustainability should be added as the seventh variable of project performance and success.
Martens and Carvalho (2016a)	<i>Based on Martens and Monteiro de Carvalho (2014)</i> Variables of PS: 1. Project Efficiency 2. Impact on Customer 3. Impact on Team 4. Business Success 5. Preparation for the future 6. Sustainability	<i>Based on Martens and Monteiro de Carvalho (2014)</i> Triple Bottom line perspectives operationalized in criteria representing 1. Economic dimension 2. Environmental dimension 3. Social dimension	Authors concluded that the experts showed consensus on the positive impact of SPM on most of the PS variables. However, on the effect of SPM on project efficiency, completing the project within the constraints of budget and schedule, the experts showed less consensus.
Martens and Carvalho (2016b)	<i>Based on Martens and Monteiro de Carvalho (2014)</i> Variables of PS: 1. Project Efficiency 2. Impact on Customer 3. Impact on Team 4. Business Success 5. Preparation for the future 6. Sustainability	<i>Based on Martens and Monteiro de Carvalho (2014)</i> Triple Bottom line perspectives operationalized in criteria representing 1. Economic dimension 2. Environmental dimension 3. Social dimension	Authors found a significant positive and high contribution of SPM to all variables of PS.
Khalilzadeh et al. (2016)	<i>Based on Silvius and Schipper (2016)</i> Variables of PS: 1. The project is executed in a controlled manner 2. The agreed project deliverable is completed on schedule and within budget 3. The project's deliverable is 'fit for purpose' 4. The business objectives or goals of the project are realized 5. The stakeholders of the project are satisfied 6. The project prepares the organization for the future	<i>Based on Silvius and Schipper (2016)</i> SPM operationalized in: 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 values and ethics 5. Sustainability is about transparency and accountability 6. Sustainability is about stakeholder participation 7. Sustainability is about risk reduction 8. Sustainability is about eliminating waste 9. Sustainability is about consuming income, not capital	Authors conclude that SPM relates positively to all criteria of PS.

Carvalho and Rabechini Jr (2017)	Variables of PS: 1. Project Efficiency 2. Impact on Customer 3. Impact on Team 4. Business Success 5. Preparation for the future + Social & Environmental Performance of the project operationalized in 1. Environment damages reduction 2. Social benefits 3. Compliance to standards and legislation 4. Health and safety	Sustainable <i>management</i> of the project, operationalized in: 1. PM Focusing on sustainability 2. Green Procurement & Partnership 5. Social Responsibility Sustainable <i>deliverable</i> of the project, operationalized in: 3. Environmental Technologies 4. Designed for Environment	Authors conclude that SPM has a positive effect on Social & Environmental Performance. Authors conclude that SPM also has a positive effect on Project Success, although weak.
Malik et al. (2020)	PS operationalised in five items, not revealed	SPM operationalised in eight items, not revealed	Authors conclude a moderate positive correlation between SPM and PS.

With regards to the industries covered in the empirical studies, the traditional project industries, such as construction and oil & gas, show up more prominently than for example information technology or financial services.

Reflecting on the studies listed in Table 2, a few observations can be made.

- PS is more than the ‘iron triangle’*

The studies listed in Table 2, mostly operationalize PS in a holistic set of variables that cover both the traditional ‘iron triangle’ variables of project success, time – quality - budget, as well as variables related to the project’s deliverable and the benefits this deliverable enables. This is in line with the evolution of PS criteria that Ika (2009) observed.
- SPM is in most studied operationalized the TBL perspectives*

In most of the empirical studies, the TBL perspectives of economic dimension, environmental dimension and social dimension, are recognizable in the operationalization of SPM. This is in line with the observations of Silvius and Schipper (2014) that concluded that the TBL was the most used concept of sustainability in studies on SPM.
- The relationship between SPM and PS is mostly considered positively.*

In line with the analysis of Khalifeh et al. (2019) the overview provided in Table 2 shows that it seems that SPM supports PS, and that no negative impacts of SPM were observed. However, the limitations of the available studies lead Khalifeh et al. (2019) to comment that the relationship between SPM and PS is still inadequately addressed in the literature and that more research is needed.

3. RESEARCH DESIGN

This paragraph presents the research strategy and design of the study. The study was designed as a quantitative, survey based study. Figure 2 presents the research process of the study.

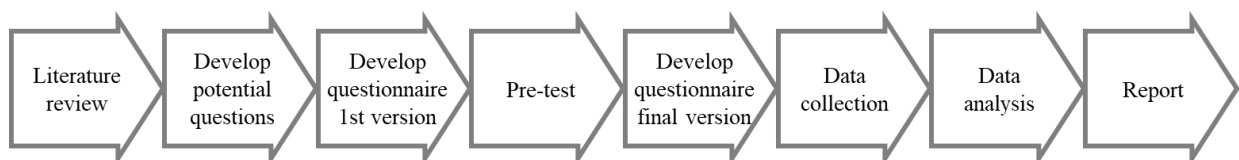


Figure-2. Research process.

3.1. Conceptual Model

Based on the concepts and models of SPM and PS, as discussed in the literature review in the previous paragraph, the researchers decided to develop separate hypotheses for the relationship of the overall concept of

SPM with PS, as well as the two interpretations of SPM found in literature: sustainability *by* the project (SbP) and sustainability *of* the project (SoP) with PS. Both SbP and SoP were operationalized in the TBL perspectives of economic, environmental and social impacts. The dependent variable, PS, was operationalised in the criteria Time, Budget, Quality, Stakeholder satisfaction and Benefits for customer, as appeared from the overview of Ika (2009) shown as Figure 1.

Based on these operationalisations, of the variables of our research question, Figure 3 shows the conceptual model for the study.

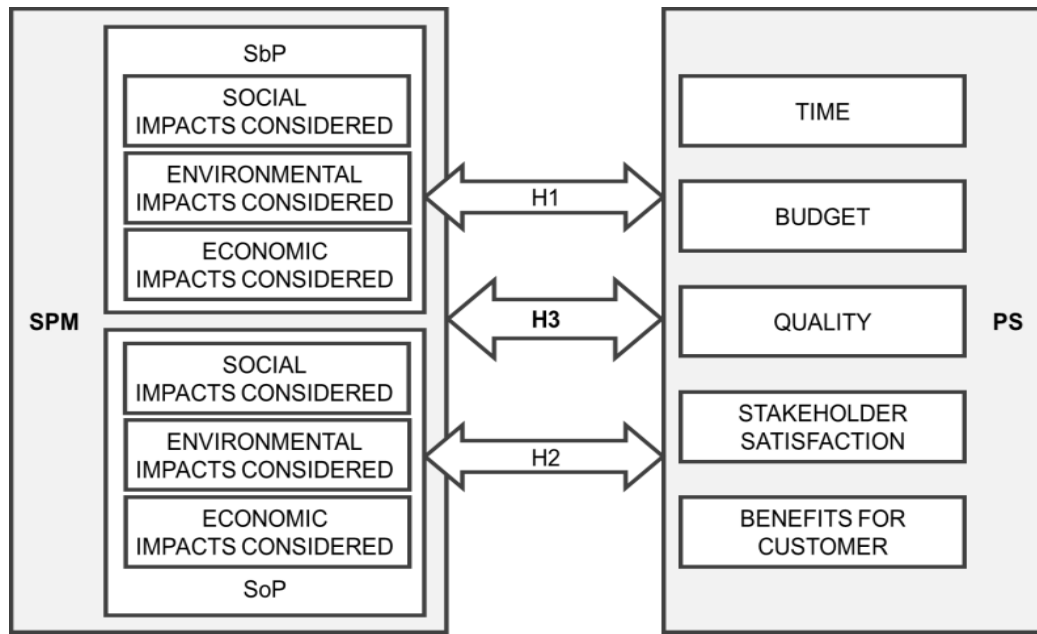


Figure-3. Conceptual model.

Following this conceptual model, the hypotheses of the study were formulated as:

H1. Projects in which the social, environmental and economic impacts of the project's deliverable are analysed and considered more, are more successful. (SbP shows a positive correlation with PS.)

H2. Projects in which the social, environmental and economic impacts of the project's management and delivery processes are analysed and considered more, are more successful. (SoP shows a positive correlation with PS.)

H3. Projects in which the social, environmental and economic impacts of the project's deliverable and processes are analysed and considered more, are more successful. (SPM shows a positive correlation with PS.)

3.2. Questionnaire Development

In the questionnaire, the independent variables (SbP and SoP) and dependent variable (PS) were operationalised in a single question per item that appears from the conceptual model, resulting in three questions for the variable SbP, three for the variable SoP and five for the variable PS. The variable SPM consisted of all items included in the variables SbP and SoP. The answering scale of these questions was designed as a five-point Likert scale, as suggested by Boone and Boone (2012) ranging from "Very little" to "Very much".

The questionnaire was completed with five demographic questions about the respondent and two questions about the work environment of the respondent. Table 3 presents the questions of the questionnaire.

The questionnaire was pre-tested with five randomly selected participants (members of the target group of the study) and an expert on SPM (one of the leading authors on the topic), which led to small improvements in the formulation of the questions.

Table-3. Structure of the questionnaire.

Question number	Variable	Topic	Question	Answer scale
1	Demographic	Gender	What is your Gender?	Category
2	Demographic	Age	What is your age?	Category
3	Demographic	Education	What level is your highest completed education?	Category
4	Demographic	Experience	How many years of experience in projects do you have?	Category
5	Demographic	Role	What is your role in your latest completed project?	Category
6	Work environment	Type of project	What type of project best describes your last completed project?	Category
7	Work environment	Size of project	What was the project budget of your last completed project?	Category
8	PS	PS	To which extent was the project completed in time?	Likert
9	PS	PS	To which extent was the project completed on budget?	Likert
10	PS	PS	To which extent was the project completed within quality?	Likert
11	PS	PS	How satisfied were the stakeholders with the project?	Likert
12	PS	PS	To which extent the project brought benefits to the customer?	Likert
13	SbP	SbP	To which extent were the social impacts and effects of the project's deliverable analysed and considered in the project?	Likert
14	SbP	SbP	To which extent were the environmental impacts and effects of the project's deliverable analysed and considered in the project?	Likert
15	SbP	SbP	To which extent were the economic impacts and effects of the project's deliverable analysed and considered in the project?	Likert
16	SoP	SoP	To which extent were the social impacts and effects of the project's management and delivery processes analysed and considered in the project?	Likert
17	SoP	SoP	To which extent were the environmental impacts and effects of the project's management and delivery processes analysed and considered in the project?	Likert
18	SoP	SoP	To which extent were the economic impacts and effects of the project's management and delivery processes analysed and considered in the project?	Likert

3.3. Data Collection and Sample

For data collection, the questionnaire was shared online, using Google forms. The geographical focus of the sampling was in Europe. Since no list exists of suitable project managers, the researchers opted for non-probability sampling. Convenience sampling was used by having the survey circulated by the researchers using personal networks and social media. Snowball sampling was also used by inviting respondents to forward the survey link to other eligible project managers.

As the Project Management Institute reports to have certified around one million project management professionals, the research team adopted the assumption that the total population of project managers consists of over one million individuals. The study therefore targeted a sample size of 384 in order to reach a 5% confidence interval at a 95% confidence level. The minimum sample size was set on 100 respondents, as Francis et al. (2004) argue that a sample size of 80 would be acceptable and Reio Jr and Shuck (2015) strongly recommend at least 100 participants. In total of 112 responses were received. Based on the assumed total population of over 1 million project managers, the sample provides a confidence interval of 9.26% at a 95% confidence level. Given the 5-point Likert scales that were used in the questionnaire, this confidence interval is satisfactory. Table 4 shows the characteristics of the sample.

Table-4. Description of the sample.

Questions about the respondent			
Question	Answer categories	Percentage	
1	What is your Gender?	Male	73.2
		Female	25.0
		Prefer not to reveal	1.8
2	What is your age?	< 25 years	0
		26-35 years	38.4
		36-45 years	26.8
		46-55 years	17
		>55 years	17.9
3	What level is your highest completed education?	Vocational training	1.8
		Undergraduate or Bachelor	25
		Graduate or Master	58.9
		Post-Graduate	14.3
4	How many years of experience in projects do you have?	0-5 years	25.9
		5-10 years	28.6
		10-20 years	20.5
		20-30 years	15.2
		> 30 years	9.8
5	What is your role in your latest completed project?	Project owner/sponsor	2.7
		Project manager/leader	61.6
		Project team member	20.5
		Project support officer	8.9
		Stakeholder external to the project team	0.9
		Other	5.4
<i>Questions about the work environment of the respondent</i>			
6	What type of project best describes your last completed project?	Construction (Infrastructure)	15.2
		Engineering	8.9
		Organisational change	22.3
		Information Technology	38.4
		Research and Development	8
		Social or Societal Development	1.8
		Other	5.4
7	What was the project budget of your last completed project?	<1 M€	45.5
		1-5 M€	27.7
		5-10 M€	15.2
		>10 M€	11.6

From this table it shows that the sample was male dominated, which reflects the gender distribution in the profession. The age distribution reflects a broad distribution, with the age groups 26 to 45 slightly overrepresented in the sample, and the group up to the age of 25 lacking. This can be explained by the fact that project management rarely is a starting position, but requires some years of experience in other positions (Silvius & de Graaf, 2019). Also the project management profession normally requires a higher level of education, which also shows from Table 4, resulting in more years in school. The experience levels of the respondents fits their age distribution. The majority of the sample is working in the position of project manager, which is also what was aimed for.

Regarding the types of projects that the respondents worked in, the sample showed *information technology* projects and *organizational change* projects as most represented types, but also *construction* and *engineering* types of projects were well represented. The majority of the projects in the sample did not exceed a budget of € 5 million.

The researchers concluded that the sample did not show any abnormalities and provides a good foundation for the data analysis.

3.4. Data Analysis

For data analysis, the data from the survey were coded 1 ('Very little') to 5 ('Very much') and analysed using SPSS release 23, thereby following the 'intervalists' view of Likert-type scales (Carifio & Perla, 2008). The analysis of the data included descriptive analysis, reliability testing and correlation analysis, based on Spearman's rho test.

4. RESULTS AND DISCUSSION

This paragraph presents the findings of the study. First the data will be reported in a descriptive manner, followed by the results of the reliability and correlation analysis.

4.1. Descriptive Analysis

Table 5 Presents the means and standard deviations of the stimulus questions in the study.

Table-5. Descriptive results for the independent and dependent variables.

Variable	Question	N	Mean	Std. Deviation
PS	8 To which extent was the project completed in time?	112	3.81	1.02
PS	9 To which extent was the project completed on budget?	112	4.00	0.99
PS	10 To which extent was the project completed within quality?	112	4.13	0.79
PS	11 How satisfied were the stakeholders with the project?	112	4.20	0.87
PS	12 To which extent the project brought benefits to the customer?	112	4.21	0.85
SbP	13 To which extent were the social impacts and effects of the project's deliverable analysed and considered in the project?	112	3.41	1.23
SbP	14 To which extent were the environmental impacts and effects of the project's deliverable analysed and considered in the project?	112	2.95	1.41
SbP	15 To which extent were the economic impacts and effects of the project's deliverable analysed and considered in the project?	112	3.78	1.18
SoP	16 To which extent were the social impacts and effects of the project's management and delivery processes analysed and considered in the project?	112	3.20	1.27
SoP	17 To which extent were the environmental impacts and effects of the project's management and delivery processes analysed and considered in the project?	112	2.71	1.35
SoP	18 To which extent were the economic impacts and effects of the project's management and delivery processes analysed and considered in the project?	112	3.56	1.31

From Table 5 it can be observed that the questions related to the success of the projects were all answered positively. The lowest score was on the criterion Time, the highest on the criterion Benefits for customer. Interestingly enough, the iron triangle criteria all scored lower than the more holistic criteria of Stakeholder satisfaction and Benefits for customer.

The SPM related questions all scored lower, when compared to the PS questions. Lowest scores in both SPM variables SbP and SoP were for the consideration of environmental aspects. This may be considered surprising, as environmental aspects in projects tend to get more attention than social aspects (Keng & Razak, 2014). However, the types of projects in the sample, with high representation of information technology and organizational change projects, might be a factor of influence here (Marnewick, Silvius, & Schipper, 2019). The consideration of economic impacts scored highest in the variables SbP and SoP, which is not surprising as the business case for projects is often dominated by the economic perspective (Silvius & Schipper, 2015).

Overall, the SbP questions scored slightly higher than the SoP questions, which is in line with the conclusion of Silvius (2017) that sustainability in projects is mostly considered related to the project's deliverable.

4.2. Reliability Analysis

Internal consistency of the variables PS, SbP and SoP was tested using the Cronbach's Alpha test. The variable PS was measured in five items, which represented the variables time, budget, quality, stakeholder satisfaction and benefits for customer. Cronbach's Alpha of PS was calculated on 0.814, which indicates a high internal consistency.

Table-6. Reliability analysis for variable PS.

Question	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
8 To which extent was the project completed in time?	16.54	7.82	0.51	0.31	0.809
9 To which extent was the project completed on budget?	16.36	7.82	0.54	0.31	0.798
10 To which extent was the project completed within quality?	16.22	8.30	0.63	0.50	0.772
11 How satisfied were the stakeholders with the project?	16.16	7.61	0.71	0.56	0.745
12 To which extent the project brought benefits to the customer?	16.14	7.91	0.66	0.48	0.763

Table 6 shows that the reliability of PS does not increase if one of the items is removed, therefore all items were kept for PS.

The variable SbP and SoP both showed a Cronbach's Alpha of 0.745. Table 7 shows the reliability analysis for SbP.

Table-7. Reliability analysis for variable SbP.

Question	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
13 To which extent were the social impacts and effects of the project's deliverable analysed and considered in the project?	6.72	4.58	0.68	0.47	0.532
14 To which extent were the environmental impacts and effects of the project's deliverable analysed and considered in the project?	7.19	4.51	0.53	0.32	0.721
15 To which extent were the economic impacts and effects of the project's deliverable analysed and considered in the project?	6.36	5.44	0.52	0.32	0.719

Also for the variable SbP, internal consistency does not improve when one of the items is dropped from the analysis. Table 8 shows the same analysis for the variable SoP.

Table-8. Reliability analysis for variable SoP.

Question	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
16 To which extent were the social impacts and effects of the project's management and delivery processes analysed and considered in the project?	6.28	4.89	0.66	0.47	0.553
17 To which extent were the environmental impacts and effects of the project's management and delivery processes analysed and considered in the project?	6.76	4.83	0.61	0.44	0.616
18 To which extent were the economic impacts and effects of the project's management and delivery processes analysed and considered in the project?	5.91	5.67	0.45	0.21	0.790

In this case, the internal consistency improves slightly when the economic item, question 18, is dropped. However, next to the internal consistency, also theoretical structure of the variable should be considered.

As the results indicated a potential high level of correlation between SbP and SoP, the internal consistency was also tested for the overall construct of SPM. This returned a Cronbach's Alpha of SPM of 0.850, which indicates a higher internal consistency than the variables SbP and SoP showed. Table 9 shows the analysis of all six questions SPM questions.

Table-9. Reliability analysis for variable SPM.

Question	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
13 To which extent were the social impacts and effects of the project's deliverable analysed and considered in the project?	16.20	24.52	0.68	0.53	0.816
14 To which extent were the environmental impacts and effects of the project's deliverable analysed and considered in the project?	16.66	23.85	0.62	0.62	0.828
15 To which extent were the economic impacts and effects of the project's deliverable analysed and considered in the project?	15.83	25.73	0.61	0.58	0.830
16 To which extent were the social impacts and effects of the project's management and delivery processes analysed and considered in the project?	16.41	24.35	0.67	0.54	0.819
17 To which extent were the environmental impacts and effects of the project's management and delivery processes analysed and considered in the project?	16.89	23.72	0.67	0.67	0.817
18 To which extent were the economic impacts and effects of the project's management and delivery processes analysed and considered in the project?	16.04	25.18	0.56	0.54	0.838

From this table it shows that SPM's internal consistency does not improve when one of the items is dropped from the analysis. Given this result and the finding that the variable SPM based on all six questions showed a higher internal consistency than the variables SbP and SoP, the researchers decided to perform the correlation analysis with the variable SPM and to exclude the variables SbP and SoP from the further analysis. Hypotheses 1 and 2 were therefore dropped from the study.

4.3. Correlation Analysis

Prior to investigating the statistical relationship between the two variables, it is helpful to create a graphical representation that includes both of these variables (Moore, Notz, & Flinger, 2013). Such a 'scatter plot' of the relation between SPM and PS is presented in Figure 4.

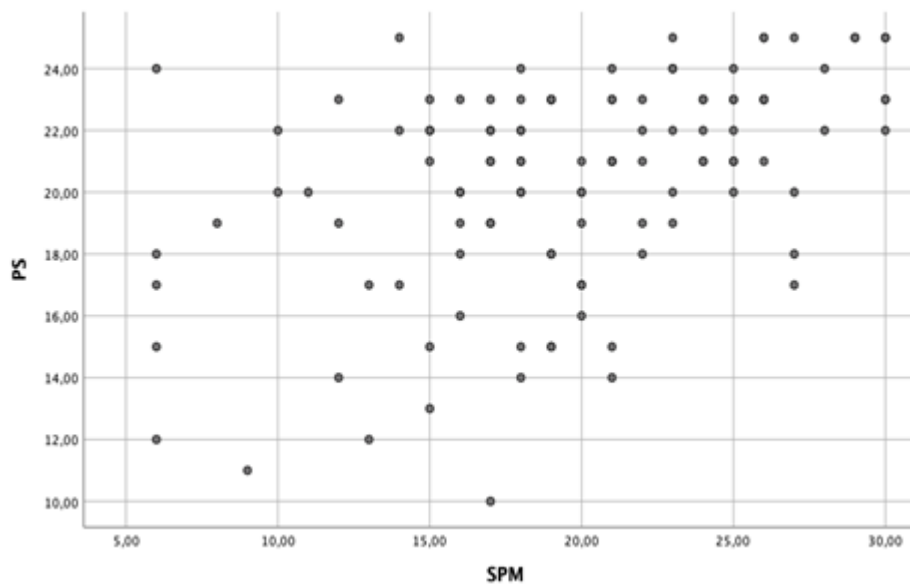


Figure-4. Scatter plot of the relation between SPM and PS.

A visual inspection of the scatter plot suggests that the relation between SPM and PS is positive, which is in line with the conclusion of Khalifeh et al. (2019) based on the meta-analysis of available studies.

Correlation between the variables of the study was determined using Spearman's rho, as is suitable. Table 10 presents the outcome of this correlation analysis.

Table-10. Correlation analysis (**p < .01).

	SPM	PS
SPM	1	
PS	.452**	1

SPM and PS showed a significant positive correlation of .452, which should be interpreted as a strong relationship (Akoglu, 2018; Leclezio, Jansen, Whittemore, & Vries, 2015). Hypothesis 3, *Projects in which the social, environmental and economic impacts of the project's deliverable and processes are analysed and considered more, are more successful*, was therefore confirmed and the study provides further support for the positive relation between SPM and PS.

4.4. Discussion

Reflecting on the findings of the study, a few observations can be made.

- The more holistic construct of PS showed high internal consistency

Following the evolution of the criteria to assess PS found in literature, the study used a holistic set of criteria of PS that included the iron triangle criteria, but also Customer satisfaction and Benefits for customer. Despite this more holistic construct, the analysis of the data from the study still showed a high internal consistency of PS. Satisfying the iron triangle constraints of a project therefore correlates with the satisfaction of stakeholders and the realization of benefits. This is in line with the earlier findings of [Serrador and Turner \(2015\)](#).

Earlier studies on the relationship between SPM and PS did not always show this consistency in a holistic assessment of PS. For example the studies by [Martens and Carvalho \(2016a\)](#) and [Silvius and Schipper \(2016\)](#) expected a difference between the assessment of the product related criteria of PS and the project efficiency or iron triangle related criteria of budget and time.

- *The overall construct SPM showed higher consistency than SbP and SoP*

As the reliability analysis showed, the construct SPM, consisting of questions that referred to the consideration of sustainability in both process and product of the project, showed a higher internal consistency than the separate variables sustainability *by* the project (SbP) and sustainability *of* the project (SoP). This confirms that, although sustainability in projects is mostly considered related to the project's deliverable ([Silvius, 2017](#)) the sustainability of the project's product cannot be considered isolated from the process of developing and managing this deliverable.

This finding may also illustrate that project managers find it hard to distinguish between the sustainability of the project's process and the project's product. This is in line with the earlier findings of [Khalilzadeh et al. \(2016\)](#) and [Carvalho and Rabechini Jr \(2017\)](#).

- *SPM and PS show a strong positive correlation*

The main finding of the study reported in this paper focuses on the relation between SPM and PS. In line with the earlier studies on this relationship, also this study found a positive correlation that can be considered as strong. And despite the concerns that [Silvius and Schipper \(2016\)](#) expressed about the potential negative effects of considering sustainability on the iron triangle criteria of PS, the overall relation between SPM and PS still appeared as positive. [Khalilzadeh et al. \(2016\)](#)

This finding confirms the conclusions found in the earlier studies of [Martens and Carvalho \(2016b\)](#); [Khalilzadeh et al. \(2016\)](#); [Carvalho and Rabechini Jr \(2017\)](#) and [Malik et al. \(2020\)](#). And although the study tested correlation between SPM and PS, and not causality, it provides another indication that SPM supports PS.

5. CONCLUSION

The study reported in this paper aimed to answer the question *How does considering sustainability in project management relate to project success?* Based on a literature analysis of the concepts of Sustainable Project Management and Project Success, the study developed a conceptual model of the relationship in which the independent variable SPM was operationalised in six questions, three questions related to SbP and three questions related to SoP. The dependent variable PS was operationalised in five items, which provided a holistic set of criteria.

Based on the analysis of the responses of 112 professionals involved in projects, the study found that both variables PS and SPM showed a high level of internal consistency. And although the variables SbP and SoP also showed a good level of consistency, the higher level of consistency of the overall variable SPM brought the researchers to the decision to focus the correlation analysis solely on the variables SPM and PS.

This correlation subsequently showed a strong and positive correlation between SPM and PS. And although the study was not aimed at developing proof for the causality between SPM and PS, this conclusion does provides another indication that SPM supports PS.

As in arguably all research, the study reported in this paper had several limitations that need to be taken into account. Firstly, our research method implied that the respondents to the questionnaire could provide a qualified opinion on both the consideration of sustainability aspects and the assessment of success of their respective projects. Given the complexity of these variables, this may not always be the case. For example, prior research indicates a dependency on the role / stakeholder perspective in assessing project success. We acknowledge this potential, but inevitable, limitation of our research.

Secondly, due to the nature of our convenience sampling strategy, external validity might have been weakened, which limits generalizations beyond the sample group. However, we argue that our findings can guide further research beyond this limitation.

Notwithstanding these limitations we feel that the findings of the study contribute to the further understanding of success as one of the 'areas of impact' of SPM.

The implication for practice of this study may be a further debunking of the myth that considering sustainability costs time and money and therefore endangers the success of a project. The findings of the study provide further proof that SPM supports PS.

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