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Sustainability in project management: A literature review and impact analysis

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Abstract
Sustainability is one of the most important challenges of our time. How can we develop prosperity, without compromising the life of future generations? Companies are integrating ideas of sustainability in their marketing, corporate communication, annual reports and in their actions.

Projects play a pivotal role in the realisation of more sustainable business practices, and the concept of sustainability has more recently also been linked to project management. The emerging literature on this topic provides strong indications that considering sustainability impacts project management processes and practices. However, the standards for project management fail to address the sustainability agenda.

This article provides a structured review of 164 publications, covering the time period 1993 - 2013, that relate sustainability to project management. The research questions answered are: 'How is sustainability defined or considered in the context of project management?' and, 'How does considering sustainability impact project management?'

Based on an identification of relevant dimensions of sustainability that was evident from the publications, we identified the areas of impact of sustainability on project management. It appeared that considering sustainability impacts project management on different levels. Considering sustainability implies, firstly, a shift of scope in the management of projects: from managing time, budget and quality, to managing social, environmental, and economic impact. Secondly, it implies a shift of paradigm

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of project management: from an approach that can be characterised by predictability and controllability, to an approach that is characterised by flexibility, complexity and opportunity. And thirdly, considering sustainability implies a mind shift for the project manager: from delivering requested results, to taking responsibility for sustainable development in organisations and society.

With these findings, the practices and standards of project management can be developed further to address the role projects play in creating sustainable development.

Keywords Project, Project management, Sustainability, Sustainable development

INTRODUCTION

When the opening key-note presentation of the 2008 World Congress of the International Project Management Association (IPMA), called upon the project management profession to "*take responsibility for sustainability*" (McKinlay, 2008), the consideration of the principles of sustainability in project management was still in its infancy. Some authors, for example Brent and Labuschagne (2006), Labuschagne and Brent (2005, 2007, 2008) and Pade, Mallinson and Sewry (2006, 2008), were performing studies on the topic, and the Association for Project Management recognised that "*the planet earth is in a perilous position with a range of fundamental sustainability threats*" and "*Project and Programme Managers are significantly placed to make contributions to Sustainable Management practices*" (Association for Project Management, 2006, p. 1, 7). However, Gareis, Huemann and Martinuzzi, observed in 2009, that "*Sustainable development in temporary organizations such as projects and programs is rarely considered*" (Gareis et al., 2009, p. 1). And Eid concluded that the standards for project management "*fail to seriously address the sustainability agenda*" (Eid, 2009, p. 288).

More recently, Silvius and Tharp (2013) concluded that "*the relationship between sustainability and project management is … picking up momentum*" and that the majority of studies was published in the last four years (Silvius & Tharp, 2013, p. xix). This growing attention for the consideration of sustainability in project management is encouraging, however, it also bears some challenges as the concept of sustainability is understood by instinct, but difficult to express in concrete, operational terms (Briassoulis, 2001). The content and understanding of corporate sustainability also varies according to the context (van Marrewijk, 2003). With insights and knowledge developing, Silvius (2013) concludes that an overview is needed. This article aims to contribute to this overview by providing a structured review of the available literature on sustainability and project management. With this review, we aim to answer two main research questions: How is sustainability defined or considered in the context of project management? How does considering sustainability impact project management?

The remainder of this article is organised as follows. In the next section, the methodology of selecting, retrieving and analysis is presented. The section entitled findings and discussion presents the content analysis of the two main research questions and provides a synthesis as a step towards theory building. We then reflect

on these findings and develop a definition of sustainable project management. The article will be concluded with a conclusion and suggestions for further research.

METHODOLOGY

In our study, we used the systematic literature review methodology of data selection, extraction, analysis and synthesis (Tranfield, Denyer, & Smart, 2003).

The data selection involved a systematic periodic search for articles related to sustainability and project. Following the recommendation by Bauer and Bakkelbasi (2005) that "*researchers should consult Google Scholar ..., especially for a relatively recent article, author or subject area*" (Bauer & Bakkelbasi, 2005), we used Google Scholar as a search engine. And although there is a debate within the scientific community on the use of Google Scholar as an academic database (Henderson, 2005), it is also considered to provide "*unique options*" (Falagas, Pitsouni, Malietzis, & Pappas, 2008, p. 342) to the academic community.

As search strings, we used the terms 'sustainable' or 'sustainable development' simultaneously with 'project' or 'project management'. We repeated the search with the intersection of 'CSR' and 'project' or 'project management'.

As the consideration of sustainability in project management is still an emerging field of study (Silvius, Schipper, Planko, van den Brink, & Köhler, 2012), we considered articles published in peer-reviewed journals, regardless of their impact factor (Seglen, 1994). And, as Tranfield et al. (2003) suggested that a systematic literature review should not only be conducted in published journals listed in bibliographic databases, we included also books, book chapters and conference proceedings.

Based on the abstracts of the publications, we removed publications from the selection that interpreted sustainability solely as the endurance of the project or project result, without mentioning any societal or environmental perspective or context, as this interpretation does not address the scope of this article. For the same reason, we also excluded papers that did not discuss sustainability in the context of project management.

For data extraction, we used the databases Science Direct, Business Source Premier, Ebsco-Host and JSTOR to retrieve the full publications for our analysis. Information from the articles was extracted and the following aspects were coded: (i) type of article, (ii) research strategy, (iii) industries studied or discussed, (iv) definition of sustainability, and (v) main findings on the impact of sustainability on project management. We now discuss these aspects in more detail:

(i) type of article

Under this aspect the articles were differentiated according to their nature: 'conceptual' versus 'empirical'. Articles were coded conceptual when they were solely based on deductive reasoning without any empirical research. Articles were labeled empirical when they included or reported any empirical data obtained from qualitative research methods (i.e., interviews) and/or quantitative methods (i.e., surveys). We also coded the approach of the article as: 'interpretive', meaning how sustainability *could be* interpreted in the context of project management, 'descriptive', meaning how sustainability *is* interpreted in the context of project management, and/or 'prescriptive', meaning how sustainability *should be* integrated into projects from a moral or logical point of view.

(ii) research strategy

Under this aspect the research methods deployed in the articles were coded as: 'experiment', 'survey', 'case study', 'action research', 'grounded theory' and/or 'archival analysis' (Saunders, Lewis, & Thornhill, 2012).

(iii) industries studied or discussed

Under this aspect we summarised the industries that were specifically studied or considered in the articles. The relevancy of this aspect is based on the understanding that projects take place in different contexts (i.e., construction, information technology, sustainable development) and the content and understanding of sustainability may vary according to the context (van Marrewijk, 2003).

(iv) definition of sustainability

Under this aspect we coded the aspects or dimensions of sustainability found in the publications. Following the 'triple bottom line' concept of sustainability (Elkington, 1997), we differentiated a 'social', an 'environmental' and an 'economical' dimension and noted when the articles also mentioned other dimensions in their definition of sustainability.

(v) main findings on the impact of sustainability on project management

Under this aspect we summarised the main findings and conclusions of the publications, focusing on the areas of project management to which the conclusions of the article related.

The analysis of the data included a quantitative analysis of occurrence within the different aspects, as listed in points (i) to (v), as well as a qualitative content analysis. This method was selected because of its suitability "*to provide knowledge and understanding of the phenomenon under study*" (Downe-Wamboldt, 1992, p. 314). In this analysis, we combined the conventional, directed and summative content analysis approaches (Hsieh & Shannon, 2005).

Our final sample consisted of 164 publications (see Appendix), covering a time frame of 20 years: 1993 (earliest publication found) to 2013. The 164 publications consisted of 15 books, 27 book chapters, 70 journal articles and 52 conference papers. Figure 1 presents a chronological overview of the publications.

FIGURE 1 Overview of publications in the sample

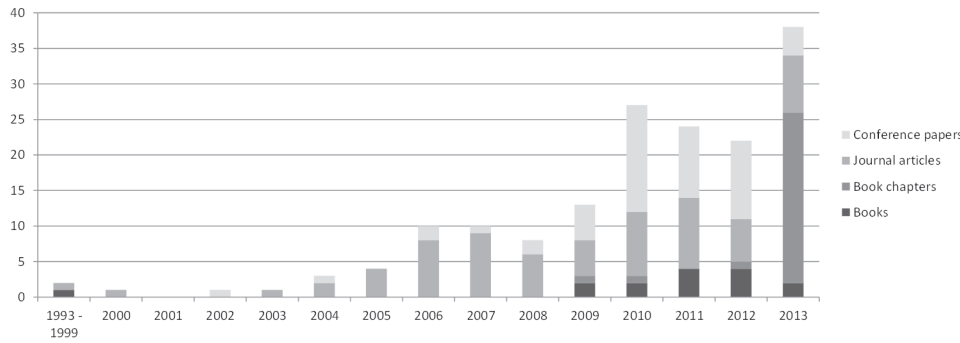


Figure 1 shows that 76% of the publications in the sample were published within the last 5 years. Peaks can be identified in the year 2010 for conference papers, probably due to a specific conference dedicated to sustainability in project management (as reported by Knoepfel, 2010), and in the year 2013 for book chapters, due to the publication of the first edited volume on the topic (Silvius & Tharp, 2013).

Forty-two percent of the publications in the sample were of a conceptual nature, whereas 56% included empirical work. In the empirical studies, the most frequently used research strategy was case studies (single or multiple). Case studies accounted for 76% of the empirical studies. In 23% of the studies a survey was used. One study used a simulation method.

The approach of the conceptual publications was mostly interpretive, with 35% of the publications adding a prescriptive element. The approach of the empirical studies was predominantly descriptive.

Sixty-five percent of the publications considered or studied a specific industry, of which the majority (55%) concerned the building and construction industry. Other industries that were significantly represented were manufacturing, regional development and energy (all 10%).

FINDINGS AND DISCUSSION

This paragraph presents the findings of the two main questions of our literature review: 'How is sustainability defined or considered in the context of project management?' and, 'How does considering sustainability impact project management?' For each question, we will present an overview of the content of the publications and provide a synthesis as a step towards theory building.

Definition of sustainability

One of the most widely used definitions of sustainable development states that sustainable development is "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (Bruntland, 1987). And although about half of the publications in the sample does not explicitly provide a definition of sustainability or sustainable development, 28% of the publications refer to this definition of the World Commission on Environment and Development (Bruntland, 1987) as a conceptual starting point.

In their interpretations of sustainability, the publications in the sample refer most often (86%) to the 'triple bottom line' or 'Triple-P (People, Planet, Profit)' conceptualisation of sustainability (Elkington, 1997). However, the publications differ in their consideration of the different 'P's. Ninety-six percent of the publications mention an economic dimension, 89% mention a social dimension and 86% mention an environmental dimension.

Papers that focus on sustainable or 'green', construction projects and project management mostly discuss the combination of the economic and the environmental dimensions, whereas papers that focus on sustainable development projects tend to discuss mainly the social dimensions.

However, several publications in the sample consider more dimensions or 'principles' of sustainability that are relevant to project management. For example Gareis, Huemann, Martinuzzi, Sedlacko and Weninger (2011b) define sustainability with the principles: economic, social and ecologic orientation; short-, mid- and long-

term orientation; local, regional and global orientation; and value orientation. The last dimension, value orientation, refers to sustainability as a normative concept that requires specific values underpinning the attitudes and behaviours of individuals. This dimension can also be found with Eid (2009), Eskerod and Huemann (2013) and Schieg (2009). Other dimensions or principles of sustainability that are mentioned include risk reduction (Gareis, Huemann, & Martinuzzi, 2010; Goedknegt, 2012),

TABLE 1 Additional dimension of sustainability relevant to project management

Additional dimensions	Considered by
A values dimension	Eid (2009); Eskerod & Huemann (2013); Gareis et al. (2009, 2010); Gareis Huemann, Martinuzzi, Sedlacko & Weninger (2011b); Gareis, Huemann, Martinuzzi, with Weninger & Sedlacko (2013); Goedknegt (2012); Keeble, Topiol, & Berkeley (2003); Keeys (2012); Khalfan (2006); Mishra, Dangayach, & Mittal (2011); Prieto (2011); Russell (2008); Schieg (2009); Silvius & Nedeski (2011); Silvius et al. (2012); Silvius, Schipper, & Nedeski (2013a, b); Talbot & Venkataraman (2011, 2013)
A time dimension	Al-Saleh & Taleb (2010); Badiru (2010); Brent, Heuberger, & Manzini, (2005); Brent & Labuschagne (2006, 2007); Eid (2002, 2009); Eskerod & Huemann (2013); Gareis et al. (2009, 2010, 2011, 2013); Goedknegt (2012); Haugan (2012); Herazo, Lizarralde, & Paquin, (2010); Keeys (2012); Khalfan (2006); Labuschagne & Brent (2005, 2007, 2008); Morfaw (2011, 2012); Mulder & Brent (2006); Müller-Pelzer (2009); Pade et al. (2008a); Pade-Khene, Mallinson, & Sewry, 2011); Prieto (2011); Robichaud & Anantatmula (2011); Scanlon & Davies (2011); Schieg (2009); Silvius & Nedeski (2011); Silvius et al. (2012, 2013a, b); Talbot & Venkataraman (2011, 2013); Tam (2010a); Taylor (2010)
A geographical dimension	Badiru (2010); Edum-Fotwe & Price (2009); Eskerod & Huemann (2013); Gareis et al. (2009, 2010, 2011, 2013); Goedknegt (2012); Gregersen, Lundgren, & White, (1994); Haugan (2012); Morfaw (2011, 2012); Müller-Pelzer (2009); Prieto (2011); Schieg (2009); Silvius & Nedeski (2011); Silvius et al. (2012); Taylor (2010); van Pelt (1993)
A performance dimension	Craddock (2013); Eid (2009); Maltzman & Shirley (2010, 2013); Thoumy & Vachon (2012); Tiron-Tudor & Dragu (2013)
A participation dimension	Ding (2008); Eskerod & Huemann (2013); Goedknegt (2012, 2013); Klotz & Horman (2010)
A waste (reduction) dimension	Eid (2002); Khalfan (2006); Ma (2011); Maltzman & Shirley (2010, 2013)
A transparency dimension	Achman (2013); Khalfan (2006); Silvius & Nedeski (2011); Silvius et al. (2012)
An accountability dimension	Achman (2013); Silvius & Nedeski (2011); Silvius et al. (2012)
A cultural dimension	AlWaer, Sibley, & Lewis (2008)
A risk (reduction) dimension	Gareis et al. (2009, 2010); Goedknegt (2012); Turner (2010)
A political dimension	Pade et al. (2008a); Pade-Khene et al., 2011)

transparency (Khalfan, 2006; Silvius et al., 2012), and performance (Craddock, 2013; Eid, 2009; Maltzman & Shirley, 2010). Table 1 summarises the additional dimensions, next to the social, environmental and economic dimensions of the triple bottom line, that are mentioned in the publications in our sample. These dimensions provide additional insight as to how sustainability is considered in the context of project management.

Synthesis

After the analysis of the dimensions of sustainability found in the publications on sustainability in project management, we identified the following dimensions of sustainability as being relevant to understanding the impact of sustainability on project management.

Sustainability is about balancing or harmonising social, environmental and economical interests

In order to contribute to sustainable development, a company should satisfy all 'three pillars' of sustainability: social, environment and economic (Elkington, 1997). The dimensions are interrelated, that is, they influence each other in various ways.

Sustainability is about both short-term and long-term orientation

A sustainable company should consider both short-term and long-term consequences of their actions, and not only focus on short-term gains (Gareis et al., 2011b). The dimension of 'both short-term and long-term orientation', focuses the attention to the full lifespan of the matter at hand (Brent & Labuschagne, 2006).

Sustainability is about local and global orientation

The increasing globalisation of economies affects the geographical area that organisations influence. Intentionally or not, many organisations are influenced by international stakeholders whether these are competitors, suppliers or (potential) customers. The behaviour and actions of organisations therefore have an effect on economical, social and environmental aspects, both locally and globally. "*In order to efficiently address these nested and interlinked processes sustainable development has to be a coordinated effort playing out across several levels, ranging from the global to the regional and the local*" (Gareis, Huemann, & Martinuzzi, 2011a, p. 61).

Sustainability is about values and ethics

As argued by Robinson (2004) and Martens (2006), sustainable development is inevitably a normative concept, reflecting values and ethical considerations of society. Part of the change needed for more sustainable development will therefore also be the implicit or explicit set of values that we as professionals, business leaders or consumers have, and that influence or lead our behaviour.

Sustainability is about transparency and accountability

The principle of transparency implies that an organisation is open about its policies, decisions and actions, including the environmental and social effects of those actions and policies (International Standards Organization, 2010). This implies that organisations provide timely, clear and relevant information to their stakeholders so

that the stakeholders can evaluate the organisation's actions and can address potential issues with these actions.

Complementing the principle of transparency is the principle of accountability. This principle implies that an organisation is responsible for its policies, decisions and actions and the effect of them on the environment and society. The principle also implies that an organisation accepts this responsibility and is willing to be held accountable for these policies, decisions and actions.

Sustainability is about stakeholder participation

Considering and respecting the potential interests of stakeholders is key to sustainability. ISO 26000 emphasises the behavioural side of this principle, by mentioning "proactive stakeholder engagement" as one of its principles. Stakeholder participation therefore requires "*a process of dialogue and ultimately consensus-building of all stakeholders as partners who together define the problems, design possible solutions, collaborate to implement them, and monitor and evaluate the outcome*" (Goedknegt & Silvius, 2012, p. 3).

Sustainability is about risk reduction

The so-called precautionary principle is based on the understanding that in environment-society system interactions, the complexity, indeterminacy, irreversibility and nonlinearity has reached a level at which it is more efficient to prevent damage, rather than ameliorate it (Turner, 2010). The recent Deepwater Horizon oil-spill disaster has fuelled the discussion on the suitability of financial risk management techniques for societal and environmental risks.

Sustainability is about eliminating waste

The importance of eliminating waste is mentioned by several authors, including Maltzman and Shirley (2010, 2013). They refer to "The Seven Wastes", as identified in the Toyota production system. These seven wastes are: overproduction, waiting, transporting, inappropriate processing, unnecessary inventory, unnecessary or excess motion, and defects.

The principle of eliminating waste can also be found in the cradle-to-cradle concept (McDonough & Braungart, 2002) that builds upon the idea that waste equals food.

Sustainability is about consuming income, not capital

Sustainability implies that nature's ability to produce or generate resources or energy remains intact. The 'source and sink' functions of the environment should not be degraded. Meaning that the extraction of renewable resources should not exceed the rate at which they are renewed, and the absorptive capacity of the environment to assimilate waste should not be exceeded (Gilbert, Stevenson, Girardet, & Stern, 1996). The principle may also be applied to social perspectives (Silvius et al., 2012). Organisations should also not 'deplete' people's ability to produce or generate labour or knowledge by physical or mental exhaustion. In order to be sustainable, companies have to manage not only their economic capital, but also their social and environmental capital.

TABLE 2 Definitions of sustainable project management found in the publications

Author	Definition of sustainable project management
Deland (2009)	*Sustainable Project Management is minimising the resources you and your team use to work a project from project initiation through close.*
Ning, Zhang, & Li (2009)	*Sustainable Project Management aims to apply the principle of meeting the needs of the day without compromising the benefits of future generations, to the construction industry by providing ways of buildings that use less virgin material and less energy, cause less pollution and less waste but still provide the benefits that construction projects have brought us throughout history.*
Silvius et al. (2009)	*Sustainable Project Management is the management of project-organised change in policies, assets or organisations, with consideration of the economical, social and environmental impact of the project, its result and its effect, for now and future generations.*
Tam (2010)	*Sustainable Project Management is the promoting of positive and minimising of negative sustainability impacts (economic; environmental; and social) within the process by which projects are defined, planned, monitored, controlled and delivered such that the agreed benefits are realised and contributing to a sustainable society.*
Silvius et al. (2012)	*Sustainability in projects and project management is the development, delivery and management of project-organised change in policies, processes, resources, assets or organisations, with consideration of the six principles (*) of sustainability, in the project, its result and its effect.* * These six principles are: (1) balancing or harmonising social, environmental and economical interests; (2) both short-term and long-term orientation; (3) both local and global orientation; (4) values and ethics; (5) transparency and accountability; and (6) consuming income, not capital.

These dimensions of sustainability provide guidance for defining sustainability in project management and for the analysis of the impact of sustainability on project management.

Only a few publications in the sample actually attempt to define what they consider 'Sustainable Project Management'. Table 2 lists the definitions found in the publications.

When considering these definitions, it appears that they all fall short of covering the dimensions of sustainability listed earlier. In the discussion of the findings, we will construct a more elaborate definition of sustainable project management.

The impact of sustainability on project management

Several publications in the sample analyse or describe how considering sustainability impacts the processes and/or practices of project management. For example, in the study by Eid (2009), a forum of project management practitioners were asked about their assessment of the impact of sustainable development on project management processes. More specifically, for each project management process group (based on the *PMBOK Guide* process groups: initiating - planning - executing - controlling - closing) Eid's study asked their views on the area of integration of sustainability aspects. The study provided a number of specific leverage points for considering

sustainability in project management. Also Maltzman and Shirley (2010), Silvius et al. (2012), Tharp (2013) and several other publications, specify the impact of sustainability on project management in 'impact areas'.

Based on these articles, Table 3 provides an overview of the identified areas of impact.

The following section discusses these areas of impact in more detail.

Synthesis

Based on the analysis of the publications in our sample, we synthesised the following areas of impact of sustainability on the practices of project management.

Recognition of the context of the project

A starting point for all aspects of a project and its management is the recognition of the context of the project. Integrating the dimensions of sustainability in project management inevitably implies a broader consideration of the context of the project (Silvius et al., 2012; Tharp, 2013). Both the time and the spatial boundaries of the context are stretched when considering sustainability. The sustainability dimensions 'both short and long term' and 'local and global' especially impact the project context. In an increasingly global business world, more and more projects also touch upon the geo-economic challenges, as part of the project team may be located in emerging economies like India or China, and suppliers or customers may be all over the world. It is clear that the globalising business world also includes globalised projects and project management. Within the project management community, the discussion about globalisation aspects of the result or deliverable of the project still has to emerge.

Van den Brink (2009) illustrates the recognition of the broader context of 'Sustainable Project Management', compared to traditional or modern project management (Figure 2), by mentioning local and global society and an enlarged time scale, in a visual illustration of the scope of sustainable project management. In sustainable project management, the context of the project is addressed in relation to the organisation's strategy, but also in relation to society as a whole.

Of the current project management standards, the *PMBOK Guide* mentions internal or external environmental factors that surround or influence a project's success (Project Management Institute, 2013), but doesn't identify potential social or environmental interest as factors of influence. *PRINCE2* addresses the project context in several processes during the start-up and initiation stages of the project, but also makes no mention of a larger societal context of the project (Office of Government Commerce, 2009).

Identification of stakeholders

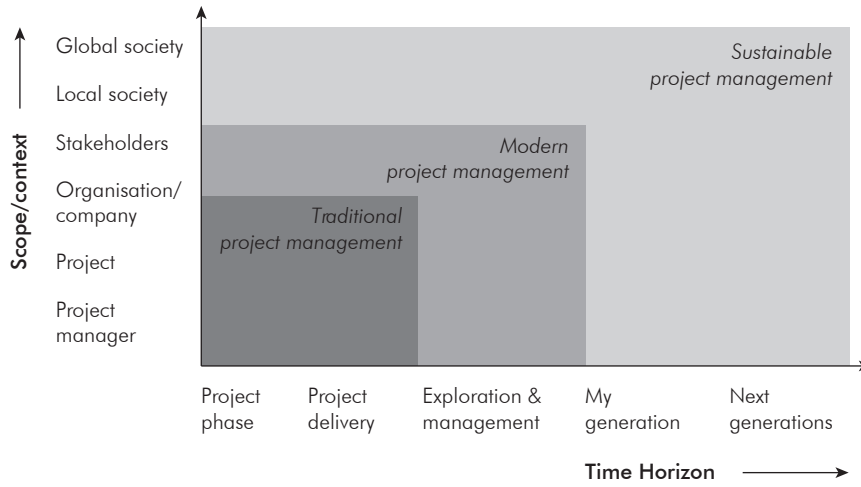
The dimensions of sustainability, more specifically, the principles 'balancing or harmonising social, environmental and economical interests', 'both short term and long term' and 'both local and global', will likely increase the number of stakeholders of the project (Eskerod & Huemann, 2013; Tharp, 2013). Typical 'sustainability stakeholders' may be environmental protection pressure groups, human rights groups, non-governmental organisations, etc. (Silvius et al., 2012).

The *PMBOK Guide* lacks any reference to typical sustainability stakeholders such as environmental protection pressure groups, human rights groups or non-

TABLE 3 The areas of impact identified in the publications on sustainability and project management

	Sources										
Identified area of impact	**Pade et al. (2008a)**	**Deland (2009)**	**Eid (2009)**	**Maltzman & Shirley (2010)**	**Taylor (2010)**	**Barnard, Ackles, & Hayner (2011)**	**Gareis et al. (2011b)**	**Tharp (2011)**	**Silvius et al. (2012)**	**Eskerod & Huemann (2013)**	**Mochal & Krasnoff (2013)**
Recognition of project context									Yes		
Identification of stakeholders	Yes					Yes		Yes	Yes	Yes	Yes
Project specifications/ requirements/deliverable/ quality criteria	Yes		Yes	Yes	Yes	Yes			Yes		Yes
Business case/costs/ benefits		Yes	Yes	Yes	Yes	Yes	Yes		Yes		Yes
Dimensions of project success	Yes					Yes	Yes		Yes		Yes
Selection and organisation of project team		Yes	Yes		Yes			Yes	Yes		
Project sequencing and schedule			Yes	Yes	Yes						Yes
Materials used					Yes	Yes			Yes		Yes
Procurement		Yes	Yes	Yes		Yes		Yes	Yes		Yes
Risk identification and management		Yes	Yes			Yes		Yes	Yes		Yes
Stakeholder involvement	Yes							Yes		Yes	Yes
Project communication	Yes			Yes		Yes		Yes		Yes	Yes
Project reporting		Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes
Project handover		Yes			Yes						
Organisational learning									Yes		Yes

FIGURE 2 Sustainable project management



(Van den Brink, 2009)

governmental organisations (Silvius, 2013). In *PRINCE2,* the identification of stakeholders is mentioned in different processes of the initial stages of the project (Office of Government Commerce, 2009). Again there is no explicit recognition of potential stakeholders representing the environmental and/or social aspects of the project.

Project specifications/requirements/deliverable/quality criteria

Integrating the principles of sustainability will influence the specifications and requirements of the project's deliverable output, and the criteria for the quality of the project (Eid, 2009; Maltzman & Shirley, 2010; Taylor, 2010), for example, the inclusion of environmental or social aspects in the project's objective and intended output and outcome (Silvius et al., 2012).

In the current project management standards, quality is first and foremost related to the requirements of the project sponsor, client or end user of the project output (Silvius, 2013). The requirements or interests of other stakeholders are considered to the degree that they may interfere with the requirements of the sponsor (Eskerod & Huemann, 2013). Integrating sustainability into project management suggests that the content, intended output/outcome and quality criteria are based on a holistic view of the project (Gareis et al., 2013), including sustainability perspectives such as 'economical, environmental and social', 'short term and long term', and 'local and global', and developed together with a broad group of stakeholders (Eskerod & Huemann, 2013).

Business case/costs/benefits

The influence of the principles of sustainability on the project content will need to be reflected also in the project justification (Silvius & Schipper, 2012). The identification of costs, benefits and the business case of the project may need to be expanded to

also include non-financial factors that refer to, for example, social or environmental aspects (Gareis et al., 2011, 2013).

The *PMBOK Guide* recognises ecological impacts and social needs as potential benefits of a project when it discussed the business case (Project Management Institute, 2013). In *PRINCE2*, the business case addresses benefits in general, without specifically addressing potential social or environmental benefits (Office of Government Commerce, 2009). None of the standards mention the consideration of ecological or social costs.

Considering the concept of sustainability in project management implies that the business case of a project addresses the triple bottom line of economic, social and environmental benefits. Investment evaluation is done based on a multi-criteria approach of both quantitative and qualitative criteria (Silvius & Schipper, 2012).

Dimensions of project success

The dimensions of project success logically relate to the criteria for project quality, mentioned earlier. Integrating sustainability implies that the definition and perception of project success take into account the 'triple bottom line' of economic, social and environmental benefits as laid out in the business case, both in the short term and in the long term. This implies that the success of the project is assessed based on the life cycle of the project and its outcome (Craddock, 2013; Pade et al., 2008).

The current standards for project management reflect a narrower perception of project success. The *PMBOK Guide* mentions that "*the success of the project should be measured in terms of completing the project within the constraints of scope, time, cost, quality, resources and risk*" (Project Management Institute, 2013, p. 35). And although the success of projects is most often defined in a more holistic perspective (Thomas & Fernandez, 2007), this broader set of criteria doesn't reflect on the way projects are managed. The constraint variables inevitably emphasise the economical perspective of the project (Silvius et al., 2012).

PRINCE2 mentions six project performance variables. These variables do not mention sustainability aspects explicitly, but they may be included in performance variables quality and benefits.

Selection and organisation of project team

Another area of impact of sustainability is the project organisation and management of the project team. The social aspects of sustainability in particular, such as equal opportunity and personal development, can be put to practice in the management of the project team (Tharp, 2013).

Chapter 9 of the *PMBOK Guide*, Project Human Resource Management, shows little consideration of social sustainability aspects such as life-work balance, equal opportunity, part time job opportunities, etc. Paragraph 9.2.2., however, pays attention to virtual teams and links this to team members working from home offices, potentially with mobility limitations or disabilities (Project Management Institute, 2013). Also the personal development of team members is addressed. The objective for this development, however, is the performance of the project team, without considering the effectiveness of team members in their professional life after the project.

PRINCE2 pays ample attention to the management and development of the project team. It does mention the activity 'Design and appoint the project management team', but in later stages no reference is made.

Project sequencing and schedule

Taylor (2010) recognises the opportunities for considering sustainability in project planning, scheduling and sequencing. He challenges project managers to think beyond 'how things are normally done', and provides several examples, one of these being offsite fabrication rather than onsite. This provides possible sustainability advantages of less waste, reduced delivery costs, better use of resources, opportunities to increase labour skills, opportunities for job creation in poorer locations, economies of mass production, etc.

Sustainable project management also implies performing the project as efficiently as possible, minimising waste. Waste can occur in materials, but also in idle resources or waiting times (Maltzman & Shirley, 2010). These last two typically relate to scheduling and sequencing.

Materials used

An obvious impact area for sustainability in project management is the selection of materials used in the project (Akadiri, Olomolaiye, & Chinyio, 2013; Silvius et al., 2012). Logical considerations are the use of hazardous substances, pollution, and energy use, both in the production process and in the use and remaining life cycle of the materials. However, the most important sustainability insight regarding materials might be applying a life cycle perspective (Brent & Petrick, 2007). This implies considering the production supply chain, but also durability, reusability and recyclability at the decommissioning stage of the project's deliverable.

Procurement

It is not just the materials used but also the processes concerned with procurement and the selection of suppliers that provide a logical opportunity to integrate considerations of sustainability, for example, appreciating the sustainability performance of potential suppliers in supplier selection (Taylor, 2010), and also in fighting bribery and non-ethical behaviour in procurement (Tharp, 2013), both by participants in the project or organisation and by potential suppliers or authorities.

The current standards of project management logically include processes related to procurement and the selection of suppliers. However, none of these standards include any references to sustainability considerations in these processes (Silvius, 2013).

Risk identification and management

Risk management, including risk mitigation, is a well-known concept in project management. In project management standards, a risk is defined as an uncertain event or set of events that, should it occur, will have an effect on the achievement of objectives (Office of Government Commerce, 2010). However, when looking at this definition from a sustainability perspective, some questions may arise. For example, which objectives are being considered in the identification of potential risks? Are these the triple-constraint objectives of the project or the desired outcomes of the project's deliverable? And whose objectives are being considered? The objectives of the project sponsor or the objectives of all stakeholders?

With the inclusion of the concept of sustainability in project management, the assessment of potential risks will need to evolve (Winnall, 2013). Logically, in the identification of risks, environmental and social risks will also be considered, and,

following the life cycle approach, these risks need to be assessed for the project's resources, processes, deliverables and effects (Silvius et al., 2012).

The *PMBOK Guide* mentions a process and several techniques to identify risks (Project Management Institute, 2013). However, these techniques do not mention the possibility of environmental and/or social risks. In *PRINCE2*, risk, as one of the central themes, is addressed in many processes throughout the project life cycle (Office of Government Commerce, 2009). However, no explicit reference is made to environmental and/or social risks.

Considering sustainability in risk identification and management does not only apply to the kind of risks considered. It also implies that risks are considered from the different points of view and interests of all stakeholders, not just the project sponsor. This also suggests that in sustainable project management, the stakeholders are participating in the identification, assessment and management of risks (Silvius, 2013).

Stakeholder involvement

Several authors (for example Gareis et al., 2009; Pade et al., 2008; Perrini & Tencati, 2006) emphasise the importance of stakeholder participation in projects. This principle logically impacts the stakeholder management and the communication processes in project management. However, the intention behind 'participation' goes beyond the identification of some specific processes. Stakeholder participation isn't so much a specific process as it is an attitude with which all project management processes are performed.

According to the ISO 26000 guideline, proactive stakeholder engagement is one of the basic principles of sustainability (International Standards Organization, 2010). Also, Eskerod and Huemann (2013) link sustainable development, projects and the role of stakeholders, and conclude that there is a need for "*incorporating stakeholders and their interests in more project management activities*" (Eskerod & Huemann, 2013, p. 45).

The *PMBOK Guide* recognises that stakeholders can be actively involved in the project (Project Management Institute, 2013), however, the processes related to stakeholders imply a perspective of stakeholders as external actors. Sustainable project management would imply involving stakeholders proactively in project activities, such as the definition of requirements, assessment of costs and benefits, project planning and scheduling, identification and assessment of risks, handling of issues, and project reporting.

Project communication

Following the principle of transparency and accountability, incorporating sustainability into project management processes and practices would imply proactive and open communication about the project, that would also cover social and environmental effects, both short-term and long-term (Khalfan, 2006; Silvius et al., 2012; Taylor, 2010). The current standards for project management reflect a more reactive approach to project communications, by focusing on the information and communication needs of the stakeholders and emphasising that the project manager should provide "*only the information that is needed*" (Project Management Institute, 2013, p. 287).

Project reporting

As the project progress reports logically follow the definition of scope, objective, critical success factors, business case, etc., the project reporting processes will also be influenced by the inclusion of sustainability aspects (Perrini & Tencati, 2006). The current standards of project management do not explicitly address reporting of sustainability aspects (Silvius, 2013).

Project handover

The different studies show a more diverse picture of the opportunities to integrate sustainability aspects. The respondents in Eid's study suggest that the closing phase of a project offers the least appealing opportunities for integrating sustainability (Eid, 2009). However, Pade et al. (2008) and Silvius et al., (2012) also point out the importance of the closing processes for a more sustainable project result. The closing processes typically include hand-over to the permanent organisation. The success of this hand-over and the acceptance of the project result are important aspects of a project's sustainability. Failed or non-accepted projects can hardly be considered sustainable, given the waste of resources, materials and energy they represent.

Organisational learning

A final area of impact of sustainability is the degree to which the organisation learns from the project. Sustainability also suggests minimising waste. Organisations should therefore learn from their projects in order to not 'waste' energy, resources and materials on successful projects (Eid, 2009; Silvius et al., 2012). The *PMBOK Guide* mentions 'Historical information and lessons learned' as part of the 'Corporate Knowledge Base' of the organisation (Project Management Institute, 2013). However, this section lacks a more explicit reference to organisational learning or knowledge management in order to improve an organisation's competence in the execution of projects.

In *PRINCE2*, the 'Lessons log' and the 'Lessons report' explicitly capture the lessons learned in a project. These lessons are explicitly addressed in the starting up stage of a project, in the process 'Capture previous lessons' (Office of Government Commerce, 2009).

REFLECTION

Sustainable project management: A paradigm shift

The preceding section identified the impact of the dimensions of sustainability on project management. Considering these impacts provides new or additional perspectives on the content and the process of a project. Several authors conclude that integrating sustainability requires a scope shift in the management of projects; from managing time, budget and quality, to managing social, environmental and economic impact (Ebbesen & Hope, 2013; Haugan, 2012; Silvius et al., 2012).

However, the impact of sustainability on project management is more than just adding a new perspective or aspect to processes and formats of the current project management standards. Adding new perspectives to the way projects are considered also adds complexity (Eskerod & Huemann, 2013; Silvius et al., 2012). Project

management therefore needs a more holistic and less mechanical approach (Gareis et al., 2013). The traditional project management paradigm of controlling time, budget and quality suggests a level of predictability and control that does not make sense in light of changes that are considered in a global and long-term perspective. Most likely, these changes and their effects are not completely known and are difficult to oversee. The integration of sustainability therefore requires a paradigm shift (Silvius et al., 2012) from an approach to project management that can be characterised by predictability and controllability of both process and deliverable, to an approach that is characterised by flexibility, complexity and opportunity (Carboni & Reeson, 2012).

The basis for the scope shift and the paradigm shift described earlier is the way the project management professional sees himself (Crawford, 2013). Traditionally project managers tend to serve their project sponsors and 'do what they are told'. They position themselves as subordinate to the project sponsor and manage their project team around scope, stakeholders, deliverables, budget, risks and resources, as specified by the stakeholder's requirements. However, project managers are well positioned to play a significant role in the implementation of the concepts of sustainability in organisations and business (Association for Project Management, 2006; Tharp, 2013). Taking up this responsibility changes the role of project managers and therefore changes the profession (Silvius et al., 2012). Integrating sustainability requires that project managers develop themselves as specialists in sustainable development and act as partners of and peers to stakeholders (Crawford, 2013; Tam, 2010). In this mind shift, the change a project realises is no longer a given, nor is it exclusively the responsibility of the project sponsor, but also the responsibility of the project manager with ethics and transparency as basic touchstones. Project management is no longer about 'managing' stakeholders, but about engaging with stakeholders in realising a sustainable development of an organisation and society.

The three shifts identified earlier can be summarised and connected as illustrated in Figure 3. The scope shift resides in the paradigm shift of sustainable project management. This paradigm shift is grounded in the mind shift.

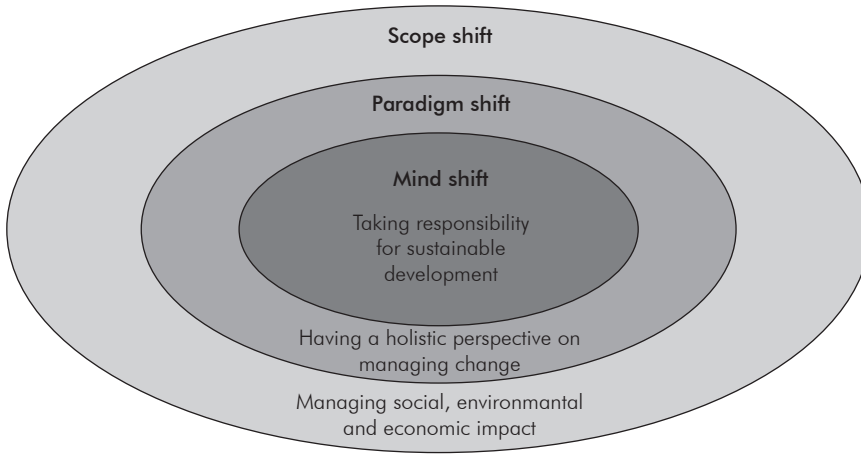
Defining sustainable project management

As stated earlier, the few definitions of sustainable project management that were provided by the publications in the sample, all fall short of covering the dimensions of sustainability, and also the impact of considering these dimensions in project management. Reflecting on our review of publications, we therefore suggest the following definition of sustainable project management:

> *Sustainable Project Management is the planning, monitoring and controlling of project delivery and support processes, with consideration of the environmental, economical and social aspects of the life-cycle of the project's resources, processes, deliverables and effects, aimed at realising benefits for stakeholders, and performed in a transparent, fair and ethical way that includes proactive stakeholder participation.*

In this definition, the dimensions of sustainability are addressed by referring to the triple bottom line of environmental, economical and social aspects, the temporal and spatial dimensions of the life cycle of the project's resources, processes, deliverables and effects, the stakeholder engagement dimension and the values dimension.

FIGURE 3 The three shifts of sustainable project management



(Silvius et al., 2012)

CONCLUSION

This article presented a structured literature review of 164 publications that relate sustainability or sustainable development to project management processes and practices. Based on the identification of relevant dimensions of sustainability that were evident from the publications, we identified the areas of impact of sustainability on project management. These areas of impact are: recognition of the context of the project, identification of stakeholders, project specifications/requirements/deliverable/quality criteria, business case/costs/benefits, dimensions of project success, selection and organisation of project team, project sequencing and schedule, materials used, procurement, risk identification and management, stakeholder involvement, project communication, project reporting, project handover, organisational learning. In short, we conclude that considering sustainability impacts basically all processes and practices of project management.

Although this list of areas of impact provides a comprehensive overview of the impact of sustainability on project management, it does not cover the full impact of the concepts of sustainability, and the pivotal role of the project manager in realising sustainable development in organisations.

In addition to the areas of impact, we concluded that there are three shifts that characterise the integration of sustainability and project management. Considering sustainability implies, firstly, a shift of scope in the management of projects: from managing time, budget and quality, to managing social, environmental, and economic impact. Secondly, it implies a shift of paradigm of project management: from an approach that can be characterised by predictability and controllability, to an approach that is characterised by flexibility, complexity and opportunity. And thirdly, considering sustainability implies a mind shift for the project manager: from delivering requested results, to taking responsibility for sustainable development in organisations and society.

With these findings, the practices and standards of project management can be developed further to address the role that projects play in creating sustainable development.

Further research

As was stated in the introduction of this article, the content and understanding of sustainability varies according to the context. One direction for further research should therefore be the specification of our findings per context, for example, industry. In the publications in the sample, the building/construction industry was well represented. However, other sectors that strongly rely on projects, for example the information technology sector, were hardly covered in the publications. We suggest that the consideration of sustainability in project management in these contexts is further developed in new studies.

Another direction for further research relates to the type of research on sustainability and project management. We observed that a large majority of empirical studies were case studies. Case studies are well suited for exploration and the development of hypotheses, but less suited for the testing of hypotheses and generalisation of knowledge. We therefore suggest that future studies build upon the current insights by testing these insights in order to develop generalisable knowledge.

We hope that this article may provide a foundation and an inspiration for these further studies.

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